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378

A TEXT BOOK OF AGADATANTRA • Dr. Shobha Bhat. K

A Text Book of AGADATANTRA



A complete
compilation
according to the
BAMS Syllabus



Dr. Shobha Bhat. K



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A Text Book of AGADATANTRA

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Derivation, Definition of visha and Agadatantra

Derivation of Agadatantra : अगदतन्त्र निरुक्ति

अगदतन्त्र - अगद + तन्त्र

अगद - अ + गद

गद - गद् + अच् प्रत्यय

The word 'Agadatantra' is derived from the combination of two words- Agada and Tantra, where 'गद' is derived by the combination of 'गद्' धातु and 'अच्' प्रत्यय and by combining the उपसर्ग 'अ' to गद, we get अगद

i.e. अगद = अ (उपसर्ग) + गद् (धातु) + अच् (प्रत्यय)'

गद means-रोग, पीडा or विष

i.e. the word 'gada' refers to a disease, discomfort, pain or poison.

रोग व्याधि गदामयाः । (अमरकोश २/६/४१)

Therefore the word अगद may refer to any of the following:-

- a) न गदः अगदः- absence of गद or disease.
- b) नास्ति गदो यस्मात्- that which can be used to combat a poison.

In the context Ayurveda, अगद is mainly used in the context of treatment of poison.

तन्त्र

‘त्रायते शरीरमनेन इति तन्त्रम्।’

The science through which positive health is preserved.

अगदतन्त्र

Acharya Priyavrata Sharma in his book Shodashanga hridayam discribed the निरुक्ति of अगदतन्त्र as:-

गा इन्द्रियाणि सद्यो घ्नन्तीत्येते गदाः बुधैः प्रोक्ताः।

विषमिति विषादजननत्वात् अगदस्तेषां प्रतीकारः ।। (षोडशाङ्गहृदयम् १४/१)

As it produces disorders of the indriyas/sense organs, it is called as 'gada' and as it produces 'vishada' or grief in people, it is called as visha. Those medicaments which fight the

above are termed as 'Adaga'.

Definition of Agadatantra:

- a) अगदतन्त्रं नाम सर्पकीट लूता मूषकादि दष्ट विष व्यञ्जनार्थं विविध विषसंयोगोपशमनार्थञ्च । (सु.सू. १/१४)
- Agadatantra is a branch of science that deals with the signs and symptoms and management of poisoning resulting from the bites of snakes, insects, spiders, rodents etc and various other poisons produced by improper combination of poisonous substance or drugs.

- b) सर्प वृश्चिक लूतानां विषोपशमनी तु या ।

सा क्रिया विषतन्त्रम् च नाम प्रोक्ता मनीषिभिः ।। (हारीत संहिता: प्रथमस्थान २/१९)

The branch of science which deals with the signs and symptoms and management of poisoning due to snakes, scorpions, spiders, and other animals is termed as Agadatantra.

Synonyms of Agadatantra:

'Agadatantra', one among the ashtangas of Ayurveda, has been described with different nomenclature in various text books of Ayurveda. Some of them are:

1. Vishagara vairodhika prashamana (Acharya Charaka).
2. Damshttra Chikitsa (Ashtanga Hridaya/Ashtanga Samgraha.)
3. Jangulika (Amarakosha)
4. Nakuli chikitsa.
5. Visha Chikitsa/Visha Vijnana/Visha Tantra.

References of Agadatantra in Brihatrayee:

Charaka Samhita: Chikitsa sthana, 23rd chapter
Sushruta Samhita: Kalpa sthana : 1 to 8 chapter
Ashtanga Sangraha: Uttara tantra: 40 to 48 chapter
Ashtanga Hridaya: Uttara tantra : 35 to 38 chapter

Derivation of Visha : विष निरुक्ति

विष- विष् (धातु) + क (प्रत्यय)

The word 'Visha' is derived from the root 'Vish' by adding 'क' pratyaya. The term 'विष' means to encompass or to get fully pervaded or to get occupied¹.

Definition of Visha:

- a) जगद्विषणं तं दृष्ट्वा तेनासौ विष संज्ञितः । (च.चि. २३/४)

The substance which causes grief to the world is called as Visha.

- b) विषाद जननत्वाच्च विषमित्यभिधीयते । (सु.क. ३/२१)

The term Visha is derived for causing 'Vishada' or depression of spirits/sorrowness even

१. 'वेदेष्टि कायम्'। 'विष्ट व्याप्तौ' 'विष विप्रयोगे' वा । (अमरकोश १/८/९)

to the devatas.

c) विषमुच्यते विषादनाद् हेतोः । (चक्रपाणि)

That which causes sorrowness to people is termed as Visha.

d) देहं प्रविश्य यद् द्रव्यं द्वषयित्वा रसादिकान् ।
स्वास्थ्यं प्राणहरं च स्यात् तद् द्रव्यं विषमुच्यते ।।

The substance which causes vitiation of the rasadi dhatus, inturn hampering the health or life of a person is termed as Visha.

Synonyms of Visha:

विष, श्वेड, गरल, कालकूट - रस तरंगिणी, अमरकोश

दारद, आहेय, हारिद्र, नील, हालाहल, शृंगी, भूगर, घोर - राजनिघण्टु

Visha Utpatti : विष उत्पत्ति

Angel of वशिष्ठ ऋषि
→ भूता की उत्पत्ति

अमृतमंथन - २२३,
Angel of Brahma - सुश्रुत

मथ्यमाने जलनिधौ अमृतार्थं सुरासुरैः । जातः प्रागमृतोत्पत्तेः पुरुषो घोरदर्शनः ।।
दीप्त तेजो चतुर्दंष्ट्रो हरिकेशोऽनलेक्षणः । जगद्विषण्णं तं दृष्ट्वा तेनासौ विषसंज्ञितः ।। (अ.ह.सू. ३५/१-२)

During Samudra mathana, the Gods and the demons churned the Ksheerasagara to obtain Amrita. Anyhow, even before Amrita evolved, a ferocious looking person who was magnificent with aura and who had four fangs, yellowish-brown hair and fiery eyes emerged called as Visha purusha. The world became despaired at his sight and due to this he was called as Visha.

Acharya Sushruta has a different opinion as regards to Visha utpatti. According to him, in the beginning of creation, a proud and arrogant demon called Kaitabha (कैटभ) caused many hindrance in the process of the creation of Lord Brahma. By this, Lord Brahma was extremely angry and this anger resulted in the production of a very dreadful person who killed the demon Kaitabha. But even after the death of Kaitabha, his anger went on increasing and created sadness or depression (Vishada) among the Gods. Hence he was named as Visha, for creating the feeling of "Vishada" i.e. depression or sadness in the Gods. After the completion of creation, Lord Brahma, for the benefit of creation, then casted the dreadful anger into sthavara and jangama visha¹.

Visha Prabhava : विष प्रभाव

रसादि साम्ये यत्कर्मविशिष्टं तत्प्रभावजम् । (अ.ह.सू. १०)

- प्रजामिमामात्मयोनेर्प्रेहमहणः सृजतः किल । अकरोदसुरो विघ्नं कौटभे नाम दर्पिहतः ।।
तस्य ऋद्धस्य वै वक्त्राद् ब्रह्मणस्तेजसो निधेः । क्रोधो विटाहवान् भुत्वा निपपाताति दारुणः ।।
स तं ददाह गर्जेहन्तमन्तकाभं महाबलम् । ततो असुरं घातयित्वा तत्तेजो अवर्धेहतादभुतम् ।।
ततो विषादो देवानामभवत्तं निरीक्ष्य वै । विषादोजननात्वाच्च विषमिरत्यभिधीयते ।।
ततः सृष्ट्वा प्रजाः शेषं तदा तं क्रोधमीश्वरः । विन्यस्तवान् स भूतेषु स्थारेषु चरेषु ।। (सु. क. ३/१९-२२)

Some dravyas exhibit Vishishta karma or a specific action which is considered as its prabhava.

The poison, after entering into the body, first vitiates the rakta/blood leading to tingling or pricking sensation all over the body. Further it causes red coloured patches on the skin, sweating, horripilation, feeling of the ants moving over the body, severe aches and pains all over the body, yawning, desire for the food stuffs having cold potency. The power or the potency of the tridoshas also gets harmed by mixing up with the blood vitiated by visha, thus leading to the death or hampering of the health¹.

Visha Prabhava According to Dosa:

The poison first vitiates that specific dosa by which it is predominant, and when it gets localised in specific seat or organ, it first produces diseases related to that organ or seat².

Since the qualities/properties present in the poison are very strong/powerful, poison is spoken of as causing aggravation of all the dosas which after undergoing aggravation abandon their normal functions. Poison not getting digested takes away life, kapha obstructs the channels of breathing and makes the person unconscious though living³.

Visha Pranahara Kriya : विष प्राणहरण क्रिया

विषं हि देहं सम्प्राप्य प्राग्दूषयति शोणितम्। कफ पित्तं अनिलांश्चानु समदोष सहाशयान्।।

ततो हृदयमास्थाय देहोच्छेदाय कल्पते।। (अ.सं.उ. ४०/१८)

After entering into the body, the poison first vitiates the blood. Then it simultaneously vitiates all the tridosas and its respective sites/ashayas and at last enters the heart, vitiating its normal functions leading to the death of an individual immediately.

ओजसो विपरीतं तत् तीक्ष्णाद्यैरन्वितैः गुणैः।

वातपित्तोत्तरं नृणां सद्यो हरति जीवितम्।। (अ.ह.उ. ३५/८)

Visha has all its gunas opposite to the ojo gunas. Hence it rapidly vitiates vatadi dosas and causes death immediately by affecting the ojas of a person.

व्यापिनस्तस्य दुष्टस्य द्रुतस्य विष तेजसा वातादयो वशं यान्ति बलिनोऽप्यबला इव।। (अ.सं.उ. ४०/१९)

After visha fastly reaches every minute part of the body, it takes control over the vatadi dosa

१. शरीरे दूषिते रक्ते सर्वं चिमिचिमायते। कोठः समण्डलः स्वेदो रोमहर्षश्च जायते।।
क्षुद्रकीटा इवाङ्गेषु विसर्पन्तीति मन्यते विनामयति गात्राणि जृम्भते शिशिरप्रियः,
व्यापिनस्तस्य दुष्टस्य द्रुतस्य विषतेजसा वातादयो वशं यान्ति बलिनोऽप्यबला इव।। (अ.सं.उ. ४०/१२)
२. विषं यदोषभूयिष्ठं तं दोषं प्राक् प्रपद्यते। आशये यस्य यस्यैव ततस्तदवतिष्ठते।।
तज्जान् विकारान् कुरुते यान् सर्वेषूपदेक्ष्यति।। (अ.सं.उ. ४०/१३)
३. विषे यस्माद्गुणाः सर्वे तीक्ष्णाः प्रायेण सन्तिहि। विषं सर्वमतो ज्ञेयं सर्वदोषप्रकोपणम्।।
ते तु वृत्तिं प्रकुपिता जहति स्वां विषादिताः नोपर्याति विषं पाकमतः प्राणान् रुणाद्धि च।।
श्लेष्मणाऽऽवृतमार्गत्वादुद्ध्वासोऽस्य निरुद्यते।
विसंज्ञः सति जीवेऽपि तस्मात्तिष्ठति मानवः।। (सु.क. ३/२५)

and makes even a strong person feel weak.

व्याप्यैवं सकलं देहमुपरुध्यं च वाहिनी ।

विषं विषमिव क्षिप्रं प्राणानस्य निरस्यति ।। (अ.सं.उ. ४०/२३)

The poison spreads all over the body, causes obstruction to the channels and expels the life of a person very quickly.

Visha Guna : विष गुण

अष्टवेगं दशगुणं चतुर्विंशत्युपक्रमम् । (च.चि. २३/६)

Visha is said to have 8 Vegas, 10 Gunas and 24 Upakramas.

★ लघु रुक्षमाशुविशदं व्यवायि तीक्ष्णं विकासि सूक्ष्मं च ।

उष्णं अनिर्देश्य रसं दशगुणमुक्तं विषं तज्ज्ञैः ।। (च.चि. २३/२४)

1. The Properties of Visha Include:-

लघु	-	Light
रुक्ष	-	Dry
आशु	-	Quick in action
विशदं	-	Non-slimy
व्यवायि	-	Quickly absorbed
तीक्ष्ण	-	Sharp
विकासि	-	Depressant
सूक्ष्म	-	Minute
उष्ण	-	Hot
अनिर्देश्य रस	-	Indefinable taste

2. Visha Gunas According to Different Acharyas:

The three Acharyas of Brihatrayee have the same opinion regarding the gunas of visha. Anyhow Acharya Charaka explains Anirdishya rasa for visha, Acharya Sushruta explains Apaki whereas Acharya Vagbhata in Ashtanga Sangraha and Hridaya explains 11 gunas including both apaki and avyakta rasa.

Charaka	Sushruta ¹	Vagbhata ^{2,3}
तीक्ष्ण	तीक्ष्ण	तीक्ष्ण
उष्ण	उष्ण	उष्ण

१. रुक्षमुक्ष्णं तथा तीक्ष्णं सूक्ष्ममाशु व्यवायि च ।

विकाशि विशदं चैव लघ्वपाकि च तत् स्मृतम् ।। (सु.क. २/१९)

२. तीक्ष्णोष्ण रुक्ष विशदसूक्ष्म व्यवाय्याशुकारि विकाषिलघ्वव्यक्त रस त्वैर्दशभिर्गुणैर्युक्तमपाकि च ।। (अ.सं.उ. ४०/८)

३. तीक्ष्णोष्ण रुक्ष विशदं व्यवाय्याशुकरं लघु ।

विकाषि सूक्ष्ममव्यक्त रसं विषमपाकि च ।। (अ.ह.उ. ३५/७)

Charaka

रुक्ष
विशद
व्यवायि
आशु
लघु
विकासि
सूक्ष्म
अनिर्देश्य रस

Sushruta

रुक्ष
विशद
यवायि
आशु
लघु
विकासि
सूक्ष्म
अपाकि

Vagbhata

रुक्ष
विशद
व्यवायि
आशु
लघु
विकासि
सूक्ष्म
अपाकि, अव्यक्त रस

लघु (Light)- लघुस्तद्विपरीतः स्याल्लेखनो रोपणस्तथा।। (सु.सू. ४६/४१९)

The property which is opposite to guru (heaviness), which helps in lekhana and ropana karma is termed as laghu.

रुक्ष (Dry)- रुक्षस्तद्विपरीतः स्याद् विशेषात् स्तम्भनः खरः।। (सु.सू. ४६/४१६)

Rooksha is opposite to snigdha and causes sthambana and khara karma.

आशु (Quick acting)- आशुकारी तथाऽऽशुत्वान्नावत्यम्भसि तैलवत्।। (सु.सू. ४६/४२३)

Aashu is one which spreads very quickly in the body just as oil spreads on water.

विशद (Non-slimy)- विशदो विपरीतो अस्मात् क्लेदाचूषण रोपणः।। (सु.सू. ४६/४१७)

Vishada is opposite to picchila and removes moistness and helps healing of ulcers.

व्यवायि- व्यवायी चाखिलं देहं व्याप्य पाकाय कल्पते।

Vyavayi is that guna due to which it first spreads all over the body and then gets digested.

तीक्ष्ण (Sharp):

दाह पाककरस्तीक्ष्णः स्त्रावणो मृदुरन्यथा। (सु.सू. ४६/५१८)

Teekshna is opposite to mridu and due to its sharpness it gives rise to burning sensation, encourages suppuration and increases secretions.

विकासी:

विकासी विकसन्नेवं धातुबन्धान् विमोक्षयेत्। (सु.सू. ४६/५२३)

Due to its vikasi nature, it spreads all over the body and produces looseness of the ligaments.

सूक्ष्म (Minuteness):

सूक्ष्मस्तु सूक्ष्म्यात् सूक्ष्मेषु स्रोतः स्वनुसरः स्मृतः। (सु.सू. ४६/५२४)

Due its minuteness it enters into the minutest of the channels of the body.

उष्ण (Hotness)

उष्णास्तद्विपरीतः स्यात्पाचनश्च विशेषतः। (सु.सू. ४६/५१५)

Ushna guna is being opposite to sheeta and mainly responsible for pachana.

अनिर्देश्य रसः (Tasteless)

Due to this property, visha has no specific taste or is tasteless. Though visha has avyakta rasa or anirdishya rasa, it partakes the specific taste of the thing or animal in which it exists/lodges, just as the atmosphere water which has no particular taste acquires the specific taste of the ground or soil on which it falls upon¹.

अपाकी (Indigestible)

Due to this guna, visha is not digestable.

3. According to Sharangadhara Samhita, the properties of Visha include:

व्यवायि च विकासि स्यात्सूक्ष्मं छेदि मदावहम्। → विघ्ना गुण ४

आग्नेयं जीवितहरं योगवाहि स्मृतं विषम्।। (शा.सं.प्र.४/२२, २३)

Apart from the gunas explained in brihatrayee, Sharangadhara explains gunas like chedi, madavaha, agneya guna, jeevitaharana and yogavahi to visha.

Visha karma based on its guna²:**Guna (Properties) Karma (Action)**

रुक्ष	Aggravates vata dosa.
उष्ण	Aggravates pitta and rakta.
तीक्ष्ण	Overwhelms the mind and tend to disintegrate the marma and बन्ध i.e. मर्मघ्न
सूक्ष्म	Penetrates into the minute channels and deranges the physiology.
आशु	Instantaneous in action and hence fatal in no time.
व्यवायि	Spreads very fast and causes derangement in normalcy in no time.
विकासी	Causes destruction in dosa-dhatu and mala and is प्राणघ्न
विशद	Does not stay in one part of the body.
लघु	By being extremely light, it becomes irremediable/दुरुपक्रम.
अविपाकी/अव्यक्त रस	As it is indigestible or indivisible, it cannot be assimilated for expulsion and hence proves troublesome.

- यथा अव्यक्तरसं तोयमन्तरीक्षान्महीगतम् । तेषु तेषु प्रदेशेषु रसं तं तं नियच्छति॥
एवमेव विषं यद्यद्रव्यं व्याप्यावतिष्ठते । स्वभावादेव तं तस्य रसं समनुवर्तते॥ (सु.क. ३/२३-२४)
- रौक्ष्याद्वातमशैत्यात्पित्तं सौक्ष्म्यादसृक् प्रकोपयति । कफमव्यक्तरत्वादन्नरसांश्चानुवर्तते शीघ्रम् ॥
शीघ्रं व्यवायिभावादाशु व्याप्नोति केवलं देहम् । तीक्ष्णत्वान्मर्मघ्नं प्राणघ्नं तद्विकासित्वात् ॥
दुरुपक्रमं लघुत्वाद्देशघातं स्यादसक्तगतिदोषम् । दोषस्थानप्रकृतीः प्राप्यान्यतमं ह्युदीरयति ॥

Visha Gati : विष गति

जङ्गमं स्यात् अधोभागम् ऊर्ध्वभागं तु मूलजम्।

तस्माद्विषाविषं मौलं हन्ति मौलं च दंष्ट्रजम्।। (च.चि. २३/१७)

The jangama visha have adho gati (downward movement) in the body whereas the sthavara visha have urdhwa gati (upward movement), therefore the two verities pacify each other.

श्लेष्मतुल्य गुणं प्रायः स्थिरमूर्ध्वगमं विषम्। प्रायः पित्तगुणैर्युक्तमधोगामि च जङ्गमम्।।

गुणैरिति विपर्यस्तैर्नहतस्ते परस्परम्। युज्यान्मूलविषं तस्माद्विषानां पानलेपयोः।। (अ.सं.उ. ४८/४)

Sthavara visha have qualities similar to kapha dosa and hence it moves upwards whereas jangama visha has qualities similar to pitta and it moves downwards. Due to opposite gunas and gati, these, therefore can be used against each other; ie. sthavara visha can pacify jangama visha and vice versa.

Visha Vega : विष वेग

धात्वन्तरेषु याः सप्त कलाः संपरिकीर्तिताः। तासु एकैकम् अतिक्रम्य वेगं प्रकुरुते विषम्।। (सु.क. ४/४०)

The visha, after entering into the body, passes from one kala to another kala which are located in between the dhatus and thus gives rise to the vegas. That is, as described in the sharira sthana of Sushruta, there are 7 kalas located between the seven dhatus, and as the visha passes from one kala to the other, it produces certain specific signs and symptoms which are termed as visha vegas.

Acharya Sushruta and Vagbhata explain 7 visha vegas, whereas Acharya Charaka explains 8 visha vegas, eighth one being Mrityu.

Visha vegas have been explained for birds and animals too. Acharya Charaka explains four vegas for animals and three vegas for birds.

Signs and Symptoms and Treatment of Visha Vega: विष वेग लक्षण, चिकित्सा:

Acharya Charaka has described 8 visha vegas which are common to both sthavara and jangama visha. The signs and symptoms and treatment of these are as follows:-

Vega Location Lakshana/Signs and symptoms Chikitsa/Treatment

I	रस	तृष्णा (thirst)	वमन
		मोह (mental confusion)	
		दन्तहर्ष (sensitivity in teeth)	
		प्रसेक (excessive salivation)	
		क्लमा (exhaustion)	
		वमथु (vomiting)	

Vega Location Lakshana/Signs and Symptoms¹ Chikitsa/Treatment²

II	रक्त	वैवर्ण्य (Discolouration of the skin) भ्रम (giddiness) वेपथु (trembling) मूर्च्छा (fainting) जृम्भा (yawning) अंग चिमिचिमा (tingling sensation) तमका: (dyspnoea)	विरेचन
III	मांस	मण्डल (circular patches) कण्डू (itching) श्वयथु (swelling) कोठा (urticaria)	क्षारागद with मधु and अबुं
IV	वातादि दोष	दाह (burning sensation) छर्दि (vomiting) अङ्गशूल (body pain) मूर्च्छा (fainting)	गोमय रस along with कपित्थ, मधु and सर्पि
V		नीलादीनां तमसश्च दर्शनम् (One sees the objects as blue etc and the vision becomes dark)	आश्च्योतनम्, अञ्जन, नस्य with swarasa of काकाण्डा (शिम्वी भेदः) and शिरीष or with गोपित्त, रजनी, मञ्जिष्ठा, मरिच and पिप्पली
VI		हिक्का (hiccup)	संज्ञास्थापन
VII		भङ्ग स्कन्ध (falling/drooping of shoulders)	विषपान in case of दंष्ट्रविष, सर्प दशं in case of विष पान
VIII		मरण	

१. तृणमोह दन्तहर्ष प्रसेक वमथु क्लमा भवन्त्याद्ये वेगे रस प्रदोषात् असृक्, प्रदोषाद्वितीये तु वैवर्ण्य भ्रम वेपथु मूर्च्छा जृम्भा अङ्गचिमिचिमा तमकाः।

दुष्ट पिशितातृतीये मण्डल कण्डू श्वयथु कोठाः। वातादिजाश्चतुर्थे दाहच्छर्दङ्गशूल मूर्च्छाद्याः। नीलादीनां तमसश्च दर्शनं पञ्चमे वेगे॥

षष्ठे हिक्का, भङ्ग स्कन्धस्य तु सप्तमे, अष्टमे मरणम् नृणां॥

(च.चि. २३/१८-२०)

२. पीतं वमनैः सद्यो हरेद्विरेकैर्द्वितीये तु।

(च.चि. २३/४५)

क्षारागदस्तृतीये शोफहरैर्लेखनं समध्वम्बु। गोमयरसश्चतुर्थे वेगे सकपित्थ मधुसर्पिः॥

काकाण्ड शिरीषाभ्यां स्वरसेनाश्च्योतन अञ्जने नस्यम्। स्यात्पञ्चमे अथ षष्ठे संज्ञायाः स्थापनं कार्यम्॥

गोपित्तयुता रजनी मञ्जिष्ठा मरिच पिप्पलीपानम्। विषपानं दष्टानां विषपीते दंशनं चान्ते॥

(च.चि. २३/४८-५०)

Acharya Sushruta has described separate visha vegas for sthavara visha and jangama visha. The signs and symptoms and treatment for sthavavisha are as follows:-

वेग	लक्षण ^१	चिकित्सा ^२
I	श्याव जिह्वा भवेत्स्तब्धा- Bluish discolouration of the tongue with loss of movement. मूर्च्छा - Fainting, श्वास - Dyspnoea	वमन, शीताम्बु सेचन, अगद with मधु सर्पि
II	वेपथु - Shivering, सादो - Debility दाह - Burning sensation कण्ठरुज - Pain in the throat	वमन, विरेचन
III	Poison enters the आमाशय and causes हृद् वेदन or pain in the heart तालु शोष - Dryness of palate, आमाशय शूल - Severe pain in the stomach. दुर्वर्णं हरिते शून लोचन - i.e. eyes will have altered colour or green colour associated with swelling.	अगदपान, नस्य, अंजन
IV	Poison reaches the पक्वाशय and produces pricking pain in the stomach (पक्वाशयस्तोद), हिक्का (hiccup), कास (cough), आन्त्रकूजन (intestinal gurgling) and शिरसश्च अति गौरवम् (feeling of severe heaviness of head)	स्नेह मिश्रित अगदपान

१. स्थावरस्योपयुक्तस्य वेगे तु प्रथमे नृणाम् । श्यावा जिह्वा भवेत्स्तब्धा मूर्च्छा श्वासश्च जायते॥
द्वितीये वेपथुः सादो दाहः कण्ठरुजस्तथा । विषमामाशय प्राप्तं कुरुते हृदि वेदनाम्॥
तालुशोषं तृतीये तु शूलं चामाशये भृशम् । दुर्वर्णं हरिते शूने जायेते चास्य लोचने॥
पक्वामाशयोस्तोदो हिक्का कासोऽन्त्रकूजनम् । चतुर्थे जायते वेगे शिरसश्चाति गौरवम्॥
कफ प्रसेको वैवर्ण्यं पर्वभेदश्च पञ्चमे । सर्वदोषप्रकोपश्च पक्वादाने च वेदना॥
षष्ठे प्रज्ञाप्रणाश्च भृशं चाप्यतिसार्यते । स्कन्धपृष्ठ कटीभङ्गः सन्निरोधश्च सप्तमे॥

(सु.क. २/३४-३९)

२. प्रथमे विषवेगे तु वान्तं शीताम्बुसेचितम् । अगदं मधुसर्पिर्भ्यां पाययेत् समायुतम्॥
द्वितीये पूर्ववद्धान्तं पाययेत्तु विरेचनम् । तृतीये अगदपानं तु हितं नस्यं तथाऽञ्जनम्॥
चतुर्थे स्नेहसंमिश्रं पाययेतागदं भिषक् । पञ्चमे क्षौद्रं मधुक क्वाथयुक्तं प्रदापयेत्॥
षष्ठेऽतीसारवत् सिद्धिरवपीडश्च सप्तमे । मूर्ध्नि काकपदं कृत्वा सासृग्वा पिशितं क्षिपेत्॥

(सु.क. ३/४०-४३)

वेग	लक्षण	चिकित्सा
V	कफ प्रसेक- More elimination of kapha वैवर्ण्य - Discolouration पर्वभेद - Pain in the joints सर्वदोष प्रकोप - Aggravation of all dosas. पक्वादाने च वेदना - Pain in the large intestine.	क्षौद्र + मधुक क्वाथ
VI	संज्ञा प्रणाश- There will be loss of consciousness भृश अतिसार - Severe diarrhea.	अतिसार चिकित्सा अवपीडक नस्य
VII	स्कन्ध पृष्ठ कटीभङ्ग Cutting pain in the shoulders, back and waist सन्निरोध - उच्छ्वासनिरोधः - Cessation of breathing.	काकपद चिकित्सा अवपीडक नस्य

The veganusara signs and symptoms and treatment for jangama visha are separately mentioned for the 3 main varieties of poisonous snakes- darveekara, mandali and rajiman sarpa which will be described later.

Visha vega in Birds and Animals:

Acharya Charaka has explained 3 visha vega for birds and four for animals¹.

Birds : पक्षी²

वेग	लक्षण
I	ध्यायति - Looks anxious
II	प्रभ्राम्यति - Giddiness
III	स्वस्ताङ्ग - Develops slothness of limbs याति पञ्चत्वम्- Death

Animal : पशु³

I	सीदति - Depression भ्रमति - Giddiness
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१. चतुष्पदां स्याच्चतुर्विधः, पक्षिणां त्रिविधः।

२. ध्यायति विहगः प्रथमे वेगे, प्रभ्राम्यति द्वितीये तु। स्वस्ताङ्गश्च तृतीये विषवेगे याति पञ्चत्वम्॥

३. सीदत्याद्ये भ्रमति च चतुष्पादो वेपते ततः शून्यः मन्दाहारो म्रियते श्वासेन हि चतुर्थवेगे तु।

(च.चि. २३/२१-२३)

- II वेपथु - Tremors
 III शून्यः - Feeling of emptiness
 मन्दाहार - Stops eating.
 IV म्रियते श्वासेन - Dies because of obstruction to respiration.

Visha Vegaantara : विष वेगान्तर

येनान्तरेण तु कलां कालकल्पं भिनत्ति हि।

समीरणेनोह्यमानं तत्तु वेगान्तरं स्मृतम्।। (सु.क. ४/४१)

The time interval as the poison, driven by vata dosa, crosses from one kala to other kala is termed as vegantara. (The intervening stage)

Visha Sankata : विष सङ्कट

✓ विष प्रकृति काल अन्न दोष दृष्यादि सङ्गमे।

विषसङ्कटमुद्दिष्टं शतस्यैकोऽत्र जीवति।। (अ.ह.उ.शु. ३५/६०)

The combination of all the factors like visha prakriti, kala, anna, dosa, dushya, etc during a specific period is called as visha sankata/fatal period in poisoning and in such a condition, only one out of hundred patients survives.

Here the specifications explained are¹:

विष प्रकृति	-	पित्त प्रकृति
विष काल	-	वर्षा ऋतु
विष अन्न	-	सर्षपादि (३३२२१८२४)
विष दोष	-	पित्त
विष दूष्य	-	रक्त
आदि	-	Refers to सात्म्यादि

Shankha Visha : शङ्खा विष

दुरन्धकारे विन्दस्य केनचिद्विष शङ्कया। विषोद्धेगाज्ज्वर छर्दि मूर्च्छा दाहोऽपि वा भवेत्।।

ग्लानिः मोहो अतिसारश्चाप्येतच्छङ्खाविषं मतम्।। (च.चि. २३/२२२)

When a person is bitten by something, in pitch darkness, the fear or suspicion of being bitten by a poisonous creature causes manifestation of symptoms of pseudo-poison which includes fever, vomiting, fainting, burning sensation, prostration, unconsciousness and diarrhea. This condition is called as shankha visha. Here, केनचित् refers to either (निर्विष सर्प) non poisonous varieties of snake or even कण्टकादि i.e. thorn or other such sharp materials. The signs

१. तत्र विषप्रकृतिः-पित्तप्रकृतिः। कालो-वर्षाः। विषान्नं-सर्षपादि। विषदोषः-पित्तम्।

दूष्यं-रक्तम्। आदिशब्देन सात्म्यादीनां ग्रहणम्। (अरुण. on अ.ह.उ.शु. ३५/६०)

and symptoms produced are due to the suspected bite, by the prabhava of visha.

Treatment:

Internal administration and prokshana/sprinkling of sita, vaigandhika (shodhita gandhaka), draksha, payas/milk, madhuka, madhu mixed with water impregnated with mantra chikitsa and also counseling has to be done for its treatment¹.

Visha Kanya (विष कन्या):

- In the ancient literatures, there are references of Visha Kanya who were employed to cause harm or death to Kings or any other persons of high and prominent positions.
- These Vishakanyas were skillful in attracting people by their affectionate gestures and endearing conversations.
- Attractive, young girls were taken away from their normal company and were habituated to take small quantities of food mixed with powerful poisons.
- The quantity of such poisons was increased gradually to such an extent that after a period of time they became immune to even severe poison and anybody coming in contact with these girls either by physical touch or by contact with their breath, urine, saliva, menstrual discharge or sexual act would die instantly.²
- Acharya Vagbhata explains the method of diagnosis of such Vishakanyas as follows:
The flower on their head dry immediately.
Mites will die on their beds.
Death of flies and insects by their touch.
Death of organisms in their bath water.³

१. सिता वैगन्धिको द्राक्षा पयस्या मधुकं मधु ।

पानं समन्त्रपूताम्बु प्रोक्षणं सान्त्वहर्षणम् ॥ (च.चि. २३/२२३), (अ.ह.उ. ३६/८९)

२. विषकन्योपयोगाद्वा क्षणाज्जह्यादसुन्नरः । (सु.क. १/६)

उक्तं च- हन्ति स्पृशन्ती स्वेदेन गम्यामाना च मैथुने । (डल्हण. सु.क. १/६)

३. आजन्मविषसंयोगात् कन्या विषमयी कृता । स्पर्शोच्छ्वासादिभिर्हन्ति तस्यास्त्वेतत्परीक्षणम् ॥

तद्भस्तकेशसंस्पर्शान् म्लायते पुष्पपल्लवैः । शय्यायां मत्कुणैर्वस्त्रे यूकाभिः स्नानवारिणि ॥

जन्तुभिर्भ्रियते ज्ञात्वा तामेवं दूरतस्त्यजेत् । (अ.सं.सु.स. ८/७३)

Important Questions:

Short Answers:

1. Visha Utpatti.
2. Visha Prabhava.
3. Visha Gati.
4. Visha Vega.
5. Visha Vegantara.
6. Visha Sankata.
7. Shanka Visha.
8. Visha Kanya

Short Essay:

1. Visha Guna.
2. Define Agadatantra. Describe the scope of Agadatantra in the present era.
3. Explain the Vishotpatti in detail.
4. Describe the Visha vega and Vegantara as described in the samhitas.
5. Illustrate the Visha Guna- Karmas.
6. Enumerate the Pranaharana kriya of Visha.

Long Question:

1. Define Agadatantra. Explain the Visha Utpatti and Vishagunas as described by various Acharyas.

Basics of Toxicology

1. Definition of Poison:

Poison is commonly defined as a substance (solid, liquid or gas) which, when administered, inhaled or swallowed, is capable of acting deleteriously on the body. Thus, almost anything is a poison.

There is really no boundary between a medicine and a poison, for, a medicine in a toxic dose is a poison and a poison in a small dose may be a medicine. In law, the real difference between a medicine and a poison is the intent with which it is given. If a substance is given with an intension to save life, it is a medicine, but if it is given with the intension to cause bodily harm, it is a poison.

2. Definition of Toxicology:

Toxicology is a science which deals with the sources, properties, mode of administration, mode of action, fatal dose, fatal period, detection, estimation - interpretation of the results of toxicological analysis, toxic signs and symptoms, management and autopsy findings (in case of death) of poisons.

3. Definition of Forensic Toxicology:

Forensic toxicology is a branch of forensic medicine dealing with medical and legal aspects of the harmful effects of chemicals or poisonous substances on human body. Sections 284, 299, 300, 304A, 324, 326 and 328 IPC etc. deal with offences relating to administration of poisons.

Ideal Suicidal Poison:

Poison should be easily available, have no bad taste, cause no pain, cheap, highly toxic, and tasteless or have a pleasant taste, capable of being taken with food or drink.

Eg: KCN, opium etc.

Ideal Homicidal Poison:

Poison should be cheap, easily available, colourless, tasteless, odourless, highly toxic, having no residual product left, should produce symptoms resembling natural diseases, having no anti-dote, showing no post mortem changes, capable of being administered with

food or drink.

Eg: Arsenic, aconite, thallium etc.

Accidental Poisoning:

It takes place as a result of the carelessness with which the poisonous and non-poisonous materials are stored together or bites by poisonous animals or by use of chemicals in industry and for household purpose.

Eg. Aspirin, Copper sulphate, snakes etc.

Features of Ideal Suicidal and Ideal Homicidal Poison:

Feature	Ideal suicidal poison	Ideal homicidal poison
Availability	Easily available	Easily available
Bad taste	No	No
Cost	Cheap	Immaterial
Toxicity	Highly toxic	Highly toxic
Solubility in food or drink	Soluble without producing any obvious change.	Should be easily taken with food or drink.
Signs and symptoms	Capable of producing painless death.	Should resemble a natural disease and must be delayed so that the person can escape.
Resemblance to a natural disease	Not necessary.	Should resemble a natural disease
Antidote	None.	None
Detection	Not particularly so.	Should not be detected by chemical test or other methods.
Examples	KCN, HCN, Opium, Barbiturates, organo-phosphorus compounds. etc	Arsenic, aconite, thallium, oleander etc.

Classification of Poisons

According to the mode of action, poisons are classified into four groups.

- (a) Corrosives
- (b) Irritants
- (c) Systemic
- (d) Miscellaneous

(a) Corrosives:

- A corrosive poison fixes, destroys and corrodes the surface with which it comes into contact. They act by extracting water from the tissues. It is a highly active irritant and not only produces inflammation but also actual ulceration of the tissues.
- It includes
 - (a) Strong acids: Mineral acids like Sulphuric acid, Nitric acid etc and organic acids like Oxalic, carbolic etc.
 - (b) Strong alkalis: Caustic soda, sodium and potassium bicarbonate etc.

(b) Irritants:

Irritant poisons causes inflammation of the gastrointestinal tract producing symptoms of pain in abdomen, vomiting and purging.

- It shows redness or ulceration of the gastro-intestinal tract.
- It includes:
 - (i) Inorganic:
 - (a) Non-metallic- Phosphorous, iodine etc
 - (b) Metallic - Arsenic, mercury, lead, copper etc
 - (ii) Organic:
 - (a) Vegetable poison- Castor oil seeds, croton oil etc.
 - (b) Animal poison- Snakes, spiders etc.
 - (iii) Mechanical: Diamond dust, chopped hair, powdered glass etc.

(c) Systemic

Poison affects a particular system.

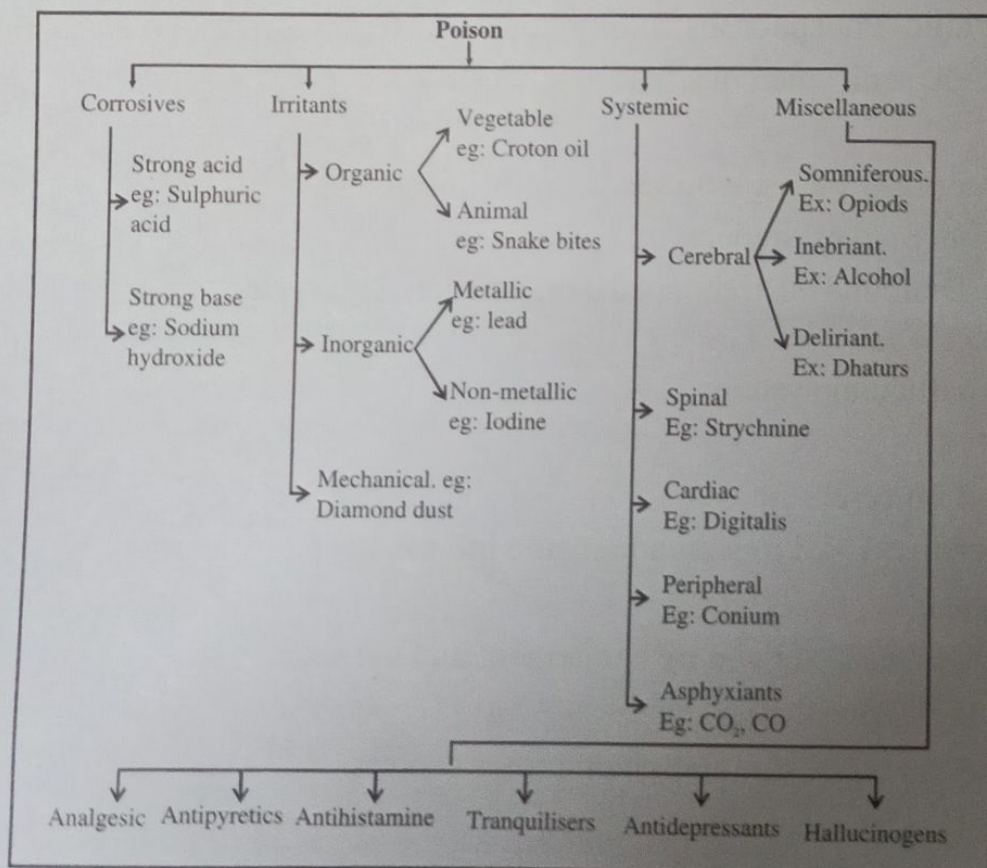
It includes:

- (i) Cerebral: Act on cerebrum.
 - (a) **Somniferous:** Used to lessen pain and induce sleep.
Eg. Opioids.
 - (b) **Inebriant:** Characterized by excitement and narcosis.
Eg. Alcohol, Anesthetics.
 - (c) **Deliriant:** Induces stimulation on motor centers.
Eg. Datura, Cannabis indica.
- (ii) Spinal: Acts on spinal cord. eg: Nux vomica (Kupilu).

- (iii) **Peripheral:** Acts on end plates of motor nerve terminals.
Eg: Conium, Curare.
- (iv) **Cardiac:** Acts on heart directly or through nerves.
Eg: Digitalis, Oleander.
- (v) **Asphyxiants :** Produces respiratory embarrassments.
Eg: CO, CO₂.

(d) Miscellaneous: It includes

- (i) **Analgesic:** Relieves pain without inducing sleep.
- (ii) **Antipyretics:** Lowers temperature.
Eg: Aspirin, paracetamol.
- (iii) **Antihistamines:** Antagonizes the action of histamine.
Eg: Antihistine.
- (iv) **Tranquillisers:** Relieves anxiety and mental tension.
Eg: Reserpine.
- (v) **Antidepressants:** Treats depression.
Eg: Imipramine.
- (vi) **Hallucinogens:** Produces bizarre effects on mind.
Eg: LSD.



Classification of Poison According to Motive or Nature of use:

1. Homicidal: Arsenic, Aconite, Digitalis, Abrus precatorius, Strychnos nux vomica.
2. Suicidal: Opium, Barbiturate, Organophosphorus, Carbolic acid, Copper sulphate.
3. Accidental: Aspirin, Organophosphorus, Copper sulphate, Snake bite, Ergot, CO, CO₂, H₂S.
4. Abortifacient: Ergot, Quinine, Calotropis, Plumbago.
5. Stupefying agent: Dhatura, Cannabis
6. Agents used to cause bodily injury: Corrosive acids and alkalies.
7. Cattle Poison: Abrus precatorius, Calotropis, Plumbago.
8. Used for malingering: Semicarpus anacardium
9. Arrow Poison: Abrus precatorius, Calotropis, Aconite, Strychnos nux vomica.
10. Aphrodisiacs : Cantharides, Cannabis, Cocaine, Arsenic, Opium

Action of Poison

Action of the poison may be:

- | | |
|-----------------------------|--------------|
| (1) Local | (2) Remote |
| (3) Local-remote / Combined | (4) Systemic |
| (5) General. | |

1. Local Action:

Local action results from the direct action of a poison on any local part of the body. These poisons can have destructive effects on local tissues & produce gross changes which can be seen through naked eye or at post mortem examination.

Ex: Corrosion in strong mineral acid, inflammation in irritants etc.

2. Remote Action:

In remote action poison is absorbed to the systems through blood and then it exerts specific action on certain organs or tissues.

It is of 2 types.

- (i) Specific- Poison has special affinity towards certain organs.
Ex: Strychnine on spiral cord, digitalis on heart etc.
- (ii) Non specific- Apart from affinity towards any organ it produces certain non specific actions.

Ex: Shock in corrosive poisons.

3. Local and Remote Action/Combined Action:

Some poisons produce both local and remote actions. They cause destructive effects on local tissues and also cause toxic effects after absorption.

Ex: Oxalic acid, corrosive acids etc.

4. Systemic Action:

Occurring on areas which compose physiological systems.

Ex: G. I. Tract

5. General Action:

Here absorbed poison evokes response from variety tissues beyond the limits of one or two systems.

Ex: Arsenic, Mercury, DDT etc.

Causes Modifying the Action of Poison:

1. Quantity:

Generally larger the quantity of a poison, larger is its action on the body.

Anyhow, sometimes the poison, if taken in large quantities may be eliminated from the body by vomiting.

Ex: Alcohol.

2. Form of a Poison:

a. Physical combination:

A substance is generally more poisonous when in gaseous state and less poisonous when liquid.

b. Chemical combination:

The action depends on the solubility or insolubility resulting from the chemical combination.

Ex. Silver nitrate and hydrochloric acid are both strong poisons, but when combined, they form an insoluble salt which may be harmless.

3. Mode of Administration:

Inhalation > IV > IM > oral > rectal etc]

4. Condition of the Body:

- Age- Poison has a greater action in children and old age.
- State of health: A healthy person tolerates poison better than a diseased person.
- Sleep and intoxication: Action of poison is delayed in sleep or in intoxicated state.
- Idiosyncrasy - There is an inherent hypersensitivity towards drugs or food resulting in symptoms like dyspnea, rigors, fever, diarrhea etc.

Ex: Penicillin, aspirin, sulfonamides, cocaine etc drugs and mushrooms, shell-fish etc in food.

- e. Habit tolerance - By habitual intake, tolerance can build up to a substance and the same dose may have no effect.
Ex: Alcohol, tobacco, barbiturates etc.
- f. Cumulative action: If not excreted and given in repeated doses, a poison can accumulate in the body and produce symptoms on reaching threshold concentration.

Routes of Administration

(i) Enteral Route:

Poisons may gain entry into the body by mouth or by rectum, to be absorbed across the enteral mucous membrane.

(ii) Parenteral Route:

All routes other than the enteral route:

Eg.

- (a) Injection: Either subcutaneous, intramuscular, intravenous, intra-arterial, intra-peritoneal, intra-theal or into the bone marrow.
- (b) By inhalation through the air passages.
- (c) By external application on wounds or unbroken skin.
- (d) Introduction into natural orifices such as vagina, urethra, nose, eyes etc.
- (e) Sublingual route

Rapidity of Action of a Poison based on Routes of Administration:

In order of rapidity of action, a poison may be fast in causing an action in the body if it is administered according to the routes given below:

- (i) Inhaled in gaseous or vapor form and usually involves a volatile substance, gas, dust, smoke etc.
- (ii) Injection into blood vessels / IV injections.
- (iii) Intramuscular, subcutaneous & intradermal injection.
- (iv) Application to a wound.
- (v) Application to a serous surface.
- (vi) Application to a broncho-tracheal mucous membrane.
- (vii) Introduction to stomach / Ingestion.
- (viii) Introduction into the natural orifices Eg: Rectum, Vagina, Urethra etc.
- (ix) Application to unbroken skin. Eg: Organophosphate, nicotine etc.

Absorption of Poison

- Before a poison can exert a toxic effect, it must come into contact with a biological system.
- The rate & site of absorption may be an important factor in the eventual toxicity of a compound & the absorption necessarily involves the passage across cell membranes whichever site is involved.
- Membranes are composed mainly of phospholipids & proteins, the proteins may be structural or have a specific function, such as a carrier for membrane transport.
- They are selectively permeable; only certain substances are able to pass through them, depending on particular physico-chemical characteristics like size, lipid solubility, similarity to endogenous molecules & polarity.

The ways in which foreign substances like a poison may pass through biological membranes are:

(a) Filtration:

- Small molecules may pass through pores in the membrane formed by proteins.
- This movement will occur down a concentration gradient.

(b) Passive Diffusion:

- For passive diffusion to occur, there must be a concentration gradient across the membrane, the foreign molecule must be lipid soluble & the compound must be non-ionized.

(c) Active Transport:

- Active transport of compounds across membranes has several important features.
- A specific membrane carrier is required.
- Metabolic energy is necessary.
- Transport occurs against a concentration gradient.
- Similar substrate may compete for uptake.

(d) Facilitated Diffusion:

- Unlike active transport, no energy expenditure is necessary here.
- This type of transport system applies to foreign compounds which are structurally similar to an endogenous compound.

(e) Phagocytosis & Pinocytosis:

- This involves the invagination of the membrane to enclose a particle or droplet respectively.

Sites of Absorption**1. GIT:**

- The GIT is the most important site of absorption as most poisons are ingested orally.
- The substance may remain in the stomach for some time particularly if it is taken with food.
- In the small intestine where the pH is around 6, there is a good blood supply and a large surface area due to folding of the lining & the presence of villi.
- Due to change in pH in the GIT, different substances may be absorbed in different areas depending on their physico-chemical characteristics.
- Lipid soluble, non-ionized compounds will be absorbed along the whole length of the tract, but ionisable substances generally will only be absorbed by passive diffusion.
- Presence of food may affect absorption from the GIT.
- Food facilitates absorption if the poison dissolves in any fat present in the food stuff but may delay absorption if the compound is only absorbed in the small intestine, as food prolongs gastric emptying and site of absorption.
- The vehicle used to suspend or dissolve the poison may have a major effect on the eventual toxicity as it may affect the rate of absorption.
- Site of absorption is important in the fate of poison, like in the stomach, the acidic conditions may cause the poison to hydrolyze or poisons such as snake venom may be inactivated.
- The bacteria in the GIT may metabolize poisons as there are many enzymes in the gut wall.

2. Lungs:

- The air we breathe may contain many foreign substances
- These may be gases like CO, vapours from solvents (methylene chloride), aerosols or particulate matter (asbestos) etc.
- The lungs have a very large surface area, around 50-100 m², an excellent blood supply & the barrier between the air in the alveolus & blood stream is very little.
- Hence absorption from the lungs is rapid & efficient.
- For compounds with low solubility in blood, absorption will be dependent on rate of blood flow & for ones with high solubility in blood; it is dependent on the breathing rate.

- Compounds in solution & particles may be absorbed by pinocytosis & phagocytosis.

3. Skin:

- The skin is constantly exposed to foreign compounds or poisons such as gases, solvents & substances in solution & so absorption through the skin is potentially an important route.
- Although the skin has a large surface area for absorption, its structure is such as to present a barrier to absorption.
- There is an outer layer of dead cells, a poor blood supply & outer cells of the epidermis are packed with keratin.
- Absorption through the skin is mainly limited to lipid soluble compounds.

Metabolism of Poisons

- After a poison has been absorbed, it passes into the blood stream.
- Absorption through the skin leads to the peripheral blood supply, major pulmonary air circulation will be involved if the compound is airborne & hence absorbed through the lungs.
- Oral absorption will lead to the entry of the poison into the portal vein supplying the liver with blood from the GIT.
- Once in the bloodstream, the compound will be distributed around the body & be diluted by the blood.
- It will then be distributed into the tissues, depending on the physico-chemical properties.
- Distribution into particular tissues involves crossing the biological membranes.
- After the poison has been absorbed into the tissues, it may undergo metabolism, also known as biotransformation.
- The metabolic fate can have an important bearing on its toxic potential, disposition in the body & excretion.
- Metabolism involves :
 - (a) Transformation of the molecule into a more polar metabolite.
 - (b) Possible increase in molecular weight & size.
 - (c) Facilitation of excretion & so elimination from the body.
- Since the major route of elimination is through the kidneys, most molecules have to be hydrophilic or be converted to hydrophilic species in order to dissolve in water leaving the body.

- Biotransformation is therefore the alteration of lipophilic substances to hydrophilic ones for subsequent excretion.

Sites of Metabolism/Biotransformation of a Poison:

(a) Liver:

- Liver is the major site of metabolism of poisons.
- When food & poisons are ingested, they pass through the walls of the intestine into the blood & travel via the large portal vein to the liver.
- The hepatic intracellular site of biotransformation is the organelle known as the SER- Smooth endoplasmic reticulum, which are made up of tiny vesicles called the microsomes.

(b) Other Sites:

- There are many tissues & body fluids which contain the necessary enzymes for biotransformation. Ex. Brain, & blood plasma, lungs, intestines, kidneys & skin.

General Reactions of Biotransformation:

- The enzymatically catalyzed reactions of biotransformation can be categorized as two general types: - Non synthetic and synthetic.
- The role of non-synthetic reactions is to prepare a molecule for the synthetic pathways by introducing reactive groups.
- The synthetic reaction involves the combination of the poison with another molecule prior to elimination via the kidneys & these require energy in the form of ATP.

Phase I/Non Synthetic

Reactions

Oxidation
Reduction
Hydrolysis
Hydration
Dehalogenation

Phase II/Synthetic

Reactions

Sulphation
Glucuronidation
Glutathione conjugation
Acetylation
Amino acid conjugation

Phase I/Non Synthetic Reactions:

Oxidation:

- The majority of oxidation reactions are catalyzed by one enzyme system- the cytochrome P450 mono oxygenase system located in the SER- of the cell, found in highest concentration in the liver.

- The process of oxidation involves 4 different steps:
 1. Addition of substrate/poison to the enzyme.
 2. Donation of an electron.
 3. Addition of oxygen & rearrangement.
 4. Donation of a second electron & loss of water.

Reduction Reactions:

- Is converse of oxidation.
- These reactions may be catalyzed by microsomal or cytosolic reductases & by the gut bacteria.
- Drugs primarily reduced are chloral hydrate, chloramphenicol, halothane etc.

Hydrolysis:

- Cleavage of drug molecule by taking up a molecule of water.
- Esters & amides are hydrolyzed by esterases & amidases & there are a number of these enzymes, which are usually found in the cytosol of cells in a variety of tissues, & some in the plasma.

Hydration:

Epoxides, which are stable metabolic intermediates, may undergo hydration catalyzed by the enzyme epoxide hydrolase located in the microsomal fraction. This is a detoxication reaction as the product formed is much less chemically reactive.

Phase 2/ Synthetic Reactions:

Sulphation:

- This involves addition of the sulphate group to a hydroxyl group.
- This process is catalyzed by a cytosolic sulphotransferase enzyme & co-enzyme-phosphoadenosine phosphosulphate.
- The product is an ester which is very polar & water soluble.

Glucuronidation:

- Glucuronic acid is a polar & water soluble carbohydrate molecule which may be added to hydroxyl groups, carboxylic acid groups, amino groups etc.
- This process utilizes glucuronosyl transferases which are microsomal enzymes.

Glutathione Conjugation:

- This process is often involved in the removal of reactive intermediates.
- Glutathione is a tripeptide found in many tissues, especially in the liver.
- It has a major protective role in the body as it is a scavenger for reactive compounds of

various types, combining at the reactive center in the molecule & so reducing or abolishing the toxicity.

Acetylation:

- The enzymes involved in acetylation are acetyltransferases & are found in the cytosol of cells in the liver, gastric mucosa & white blood cells.

Amino-Acid Conjugation:

- Foreign organic acids may undergo conjugation with amino acids
- The particular amino acid utilized depends on the species concerned.
- Glycine is the most common amino acid used.
- The acylase enzyme catalyzing the reaction is found in the mitochondria.

Excretion of Poisons

- The excretion of poison from the body is an important determinant of its biological effects.
 - Rapid elimination will reduce the likelihood of toxicity occurring & reduce the duration of the biological effect.
 - That is, removal of the poison will help to reduce the extent of damage.
- (a) The most important route of excretion for most compounds is through the kidneys into the urine.
- Other routes are secretion into:
- (b) The expired air from the lungs for volatile & gaseous compounds.
- (c) Faeces
- (d) Excretion from skin
- (e) Through the breast milk.
- (f) Some are delivered to saliva & other mucous or serous out flows.
- (g) Many polar & high molecular weight compounds are excreted by way of the bile.
- (h) Some inorganic poisons are retained in tissues like nails and hair
Ex: Arsenic, antimony etc.
- (i) Some poisons disappear by evaporation /oxidized/destroyed in body & no trace of them is detected in the tissue.
Ex: Chloroform, phosphorus etc.

Urinary Excretion

- Excretion into the urine from the blood stream applies to small water soluble molecules.

- Large molecules such as proteins do not pass out through the intact glomerulus & lipid soluble molecules such as bilirubin are reabsorbed from the kidney tubules.
- The kidneys receive approximately 25% of the cardiac output of blood & so they are exposed to & filter out a significant proportion of foreign compounds.
- Excretion into the urine involves one of the three mechanisms.
 - a) Filtration from the blood through the pores in the glomerulus.
 - b) Diffusion from the bloodstream into the tubules.
 - c) Active transport into the tubular fluid.
- Lipid soluble molecules will passively diffuse out of blood provided there is a concentration gradient.
- Water soluble molecules which are ionized at the pH of the tubular fluid will pass out into the urine.
- The greater the amount in the blood, the greater will be the rate of elimination.
- As the dose of a compound increases, its plasma level will increase.
- If excretion is via passive diffusion, the rate of excretion will increase as it is proportional to the plasma concentration.
- If excretion is via active transport, increase in the dose may lead to saturation of renal elimination & a toxic level of compound in the plasma & tissues may be reached.
- Binding to the plasma proteins may reduce excretion via passive diffusion.
- If a poison excreted into the urine is ionizable, it may become ionized when it enters the tubular fluid.
- That is, an acidic drug is ionized at alkaline urinary pH & a basic drug is ionized at an acidic urinary pH.
- The pH of urine may be affected by diet like high protein diet may cause urine to become more acid.
- The rate of urine flow from the kidney into the bladder is also a factor in excretion of foreign compounds.
- High fluid intake & production of copious urine will facilitate excretion.

Biliary Excretion:

- Excretion into the bile is an important route for certain foreign compounds, especially large polar substances.
- Bile is secreted in the liver by the hepatocytes, into the canaliculi & it flows into the bile duct & eventually into the intestine.

- Consequently compounds which are excreted into the bile are usually eliminated in the stool.
- Excretion into the bile is an active process & there are 3 specific transport systems- for neutral compounds, for anions & for cations.
- Biliary excretion may also be saturated & this may lead to an increasing concentration of compounds in the liver.
- Another consequence of biliary excretion is that the compound comes into contact with the gut micro flora.
- The bacteria may metabolize the compound & convert it into a more lipid-soluble substance which can be reabsorbed from the intestine into the portal venous blood supply & so return to the liver.
- This may lead to a cycling of the compound known as entero-hepatic recirculation which may increase the toxicity.

Excretion via the Lungs:

- Lungs are an important route of excretion for volatile compounds & gaseous metabolites of foreign compounds.
- Excretion is by passive diffusion from the blood into the alveolus assisted by the concentration gradient.
- This is a very efficient route of excretion for lipid soluble compounds as the capillary & alveolar membranes are thin & in very close proximity to allow for the normal gaseous exchange involved in breathing.
- There will be a continuous concentration gradient between the blood & air in the alveolus because of the rapid removal of the gas or vapour from the lungs & rapid blood flow to the lungs.
- Compounds may also be metabolized to volatile metabolites such as carbondioxide etc.

Other Routes of Excretion:

- Excretion into breast milk can be a very important route for certain types of compounds, especially lipid soluble.
- Poisons may be secreted into other body fluids such as sweat, tears, semen & saliva.

Diagnosis of Poison

Diagnosis of Poisoning in the Living :

To diagnose poisoning, it is essential that one should be familiar with the outstanding symptoms & signal of poisoning in the living persons together with its effect. The following are helpful to diagnose the poisoning in the living:

1. History of the case
2. Signs and symptoms.
3. Details of examination.
4. Preservation and laboratory investigation

1. History and Circumstantial Evidences:

- Diagnosis of suicidal poisoning can usually be made from the history.
- The doctor gathers toxicological, medical, psychiatric and social history helpful for the diagnosis from friends and relatives of the victim.
- Suicide note, presence of any suspicious article like tablets, bottles, vials, ampoule etc are helpful for the assessment of poisoning in the unconscious poisoned patients or dead persons.
- The history should consist of the patient's age, weight, nature or amount of substance taken, time of onset of symptoms of poisoning and typical or atypical route of poisoning.
- Besides, the doctor should obtain the other information like; geographic location where the poisoning occurred and whether the patient was emotionally or psychiatrically distressed.
- In addition, a detailed history of addiction and past medical history should be obtained, including concurrent medications and previous side effects if any.

2. Signs and Symptoms:

There is no single symptom or definite group of symptoms which are absolutely characteristic of poisoning. Anyhow the presentation of the patient may depend upon whether it is acute or chronic poisoning.

Features Indicative of Acute Poisoning-

The following should arouse suspicion of acute poisoning:

1. The symptoms appear suddenly in a healthy person.
2. The symptoms appear immediately or within a short period after food or drinks.
3. The symptoms are uniform in character & rapidly increase in severity.
4. When several persons eat & drink from the same course of poison in the food or drinks at the same time, all suffer from similar symptoms at or about the same time.
5. The discovery of poison in food taken, in the vomit or in the excreta is strong proof of poisoning.

Following are the symptoms suggestive of poisoning:

- Sudden onset of abdominal pain, nausea, vomiting, diarrhea & collapse
- Sudden onset of convulsions.
- Delirium with dilated pupils.

- The symptoms rapidly increase in severity & are followed by death or recovery.
- Rapid onset of a neurological or GIT illness in persons known to be occupationally exposed to chemicals.
- Sudden onset of convulsions.
- Persistent cyanosis.

Features Indicative of Chronic Poisoning:

- The symptoms develop gradually in this case.
- The symptoms are exaggerated after the administration of suspected food, fluid or medicine.
- Malaise, cachexia, depression & gradual deterioration of general condition of the patient is seen.
- Repeated attacks of diarrhea, vomiting etc are seen.
- When the patient is removed from his usual surroundings, the symptoms disappear.
- Traces of poison may be found in the urine, stool or vomit.

Type of Poison Involved in the Common Signs and Symptoms of Poisoning.

S.N. Sign and Symptoms	Type of Poison Involved
1. Nausea, vomiting, abdominal pain, tinnitus, deafness, sweating, fever, disorientation, lethargy, hyperventilation, vasodilatation, metabolic acidosis	Salicylates
2. Nausea, vomiting, abdominal pain, jaundice, confusion, coma may develop later	Acetaminophen
3. Delirium, hyperthermia, agitation, tachycardia, mydriasis	Amphetamines, Cocaine
4. Blindness	Quinine, Methanol
5. Hyper-salivation, miosis, bronchorrhoea	Organophosphate and Carbamate insecticides
6. Anxiety, nausea, vomiting, euphoria, headache, chest pain, hypertension, fever,	Cocaine

S.N. Sign and Symptoms**Type of Poison Involved**

tachycardia, tachypnea, agitation,
twitching, mydriasis, diaphoresis,
confusion, hypotension, abdominal
cramps, cardiopulmonary arrest,
hallucinations, seizures.

7. Nausea, vomiting, drowsiness,
reduced respiratory rate, coma,
miosis, cyanosis, seizures,
noncardiac pulmonary edema,
bradypnea

Narcotics and opioids

The following are some signs which are commonly produced by certain poisons:

S.N. Vital Sign**Type of Poison Involved**

- | | |
|------------------------------|---|
| 1. Tachycardia | Antihistamines, cocaine, salicylate, amphetamine, tricyclic antidepressants, anticholinergic drugs, alcohols |
| 2. Bradycardia | Cholinergic drugs, calcium channel blockers, opioid, digitalis, beta blockers, digoxin, clonidine, procainamide |
| 3. Hypertension | Cocaine, amphetamine, ephedrine, marijuana, anticholinergic agents- Atropine, tricyclic antidepressants, antihistamines, ethanol etc. |
| 4. Hypotension | Heroin, antidepressants |
| 5. Hyperthermia | Arsenic, cyanide, halothane, amphetamine |
| 6. Hypothermia | Opioid, barbiturates, antidepressant, CO, CNS depressants, benzodiazepines |
| 7. Coma | Narcotic, cyclic antidepressants, lead, CO, cyanide, organophosphate |
| 8. Peripheral Neuropathy | Chronic poisoning of arsenic, lead, mercury |
| 9. Tremors | CO, mercury, alcohol, caffeine, tricyclic antidepressants |
| 10. Seizures and Convulsions | Cocaine, lead, strychnine, caffeine, organophosphate |

3. Details of Examination:

- Physical examination of the poisoned person may indicate the poison or category of poison involved in poisoning.
- However, there is an extensive range of poisons which can cause some common effects on the person that make the diagnosis more difficult in such cases.
- The doctor should note abnormalities of each system of the body of the patient including any vital sign in eyes, skin, reflexes, breath sounds, and dehydration due to vomiting/diarrhea and should also observe urine colour and any kind of physical material linked with the poisoning.
- Some examples of Ocular and Olfactory Clues of poisoning on examination and their causes are as follows:

Ocular Clues

S.N. Ocular Feature	Type of Poison Involved
1. Miosis	Heroin, morphine, carbamates, carbolic acid, nicotine, barbiturates
2. Mydriasis	Amphetamine, cocaine, antihistamines, datura, curare, gelsemium, formic acid, cyanide, ephedrine
3. Nystagmus	Alcohol, benzodiazepine, marijuana, lithium, quinine
4. Blurred Vision	Anticholinergics drug, lithium, botulism, ethanol, methanol
5. Altered Colour Perception	CO, cannabis, digitalis, ibuprofen.
6. Diplopia	Ethanol, Barbiturates, opiates, cannabis

Olfactory Clues

S.N. Olfactory Feature (Characteristic Smell)	Type of Poison Involved
1. Bitter almonds	Cyanides
2. Apple like	Alcohols Acetone
3. Fishy	Aluminium phosphide, Zinc phosphide
4. Rotten eggs	Hydrogen sulphide, Carbon di sulphide
5. Garlicky	Organophosphate, Arsenic, Phosphorus, Thallium

Dermal Clues – Examination of the Skin :

S.N. Dermal Feature	Type of Poison involved
1. Dermatitis	Chronic exposure of heavy metals.
2. Hyperkeratosis and melanosis	Chronic poisoning of arsenic
3. Red color	Carbon monoxide, cyanide,
4. Blue discoloration	Nitrates, nitrites,
5. Dry and hot skin	Food poisoning.

4. Preservation and Laboratory Investigation:

- Vomitus, excreta, stomach wash contents, scraps from stains, blood, leftover food/drink etc must be preserved well for laboratory investigations.
- These can be a confirmatory clue for the type of poisoning in the living.

Poisoning in the Dead:

The evidence of poisoning will depend on

1. Post mortem examination.
2. Chemical analysis.
3. Experiment on animal.
4. Moral or circumstantial evidence.

1. Post Mortem Evidence:

External:

- The surface of the body & the clothes may show stains or marks of vomit, faeces or poison itself.
- The colour changes in the corroded skin & mucous membrane.
Eg: In nitric acid- brown colour.
- Colour of post-mortem staining may vary due to poisoning from different drugs
Eg: CO-cherry red
Phosphorus- Yellowish brown.
Hydrogen sulphide-greenish blue
Nitro-benzene - brownish red
Cyanide-brick red etc.
- Smell of mouth & nose-substances which can be identified by their odour can be traced by this.
Eg: Garlic like smell in case of phosphorous, arsenic, thallium.

Sweet and fruity smell in case of ethanol or methyl alcohol.
Bitter almond smell in HCN.

Fishy smell in Zinc phosphate.etc.

- The condition of pupils must be observed.
- Condition of hands if clenched/relaxed or presence of foreign material must be observed.
- The natural orifices-eg: mouth, nostrils, rectum & vagina, may show the presence of poisonous material or signs of it having been used
- Injection marks also must be looked for with care.
- Marks of violence- if any evident marks such as bruises or wound may suggest some form of death other than poison
- Signs of corrosion, ulceration, irritation & inflammation should be observed.
- Extent of putrefaction is to be noted.

Internal:

- Some poisons like chloroform, cyanide etc import a faint odour to the brain. Hence cranial cavity must be opened first or else it would be difficult to perceive the odour due to strong odour from thorax, abdomen etc
- Stomach- Toxic substances maybe held in the rugae or crypts of the mucosa. Poisoning may cause hyperemia, softening & ulcers & perforations.
- Liver- Substances such as chloroform, phosphorous etc may produce liver necrosis. Jaundice may be produced by phosphorous due to acute haemolytic anaemia.
- Heart- Sub endocardial hemorrhage in arsenic and mercury poisoning.
- Trachea and bronchi- corrosives may cause desquamation of mucous membrane of trachea and bronchi
- Kidneys may show degenerative changes in metallic poisoning.
- The bladder, vagina & uterus should be particularly examined for poison introduced into the body by these routes.
Eg: Criminal abortion.

2. Chemical Analysis:

- In every case of death due to poisoning the presence of poison must be demonstrated by a standard chemical analysis. For this purpose certain body fluids/facts must be sent to the nearest forensic science laboratory.
- These organs removed should be left in clean containers, if possible should be refrigerated as soon as possible after removal from the body. Rectified spirit or saturated saline is used for preservation of organs. Chemical compounds shouldn't be

added as they confuse the issue.

- The specimens of blood, urine, bile or viscera should be placed in glass container only, but not in plastic container as these fluids can leak out from plastic polymers of the container.
- Blood is the specimen of choice for detection of poisons, as it gives best indication of the quantity of drug exerting an effect on the person at the time of death.
- The urine concentrates the drug or poison in many cases. In delayed deaths, the poison maybe found in urine, when none is found in the viscera.
- The muscles especially the thigh is well preserved in advanced decomposition. Levels of drugs in the muscle more accurately reflect blood levels than the liver or kidney.

3. Experiments on Animals:

- The suspected food, medicine or fluid or the poison extracted from the viscera, can be fed to domestic animals such as dog & cat. These animals are affected by the poison in the same way as human beings.

4. Moral & Circumstantial Evidence:

- Clue regarding the recent purchase of poison by victim, his behavior, suicide note etc provide valuable information.

General Treatment of Poisoning

The aim of the treatment is to help the patient to stay alive by maintaining the respiration & circulation while he is assisted to get rid of poison by metabolism or excretion. If the poison is known then specific treatment can be given but in case of unknown condition general lines of treatment is advised. The main objective irrespective of the portal of entry of poison involves the following stages.

1. Immediate resuscitative measures.
2. Removal of unabsorbed poison.
3. Use of antidotes.
4. Elimination of absorbed poison by excretion.
5. Treatment of general signs & symptoms.

1. IMMEDIATE RESUSCITATIVE MEASURES:

- (a) **Airway:** Opening up and cleaning of the airway to remove secretion, vomitus or any foreign body that has been found as obstacles is to be done. Establish a patent airway by positioning, suctioning or endotracheal tube intubation.
- (b) **Breathing:** After clearance of air way if arterial blood gas levels can't be maintained provide supplemental oxygen, if necessary with a bag and mask devise or ventilator.

- (c) **Circulation-** IV fluid administration may be lifesaving.
- (d) **Correction of CNS depression-**
 Drugs should be administered appropriately for the correction of CNS depression.
 Drugs used may include:
 Dextrose-50%: 50-100ml IV
 Thiamine: 100mg IM or IV.
 Naloxone: 0.45-2 mg IV.
 Consider flumazenil: 0.2-0.5 mg IV.

2. REMOVAL OF UNABSORBED POISON FROM THE BODY:

Depending upon the route of entry the following methods are explained.

- (a) **Inhaled poison:** If poisonous gas has been inhaled (CO, coal gas etc) then immediately the patient should be removed to open & fresh air. The air passages are to be cleared, that is kept free from mucous by postural drainage & aspiration. Oxygen supplementation is given as required.
- (b) **Injected poison:** If the poison has been injected then a tight ligature is tied above the injection site. It is released for 1 min after every 10 min to prevent gangrene.
- (c) **Contact poison:** If the poison is spilled or sprayed on skin, eye or wound or if inserted into vagina, rectum, or urinary bladder etc. the best way to treat it is to wash it out with water. If specific antidote is known then it is administered for neutralization.
- (d) **Ingested poison:**
 Two ways are followed to remove the ingested poison
 They are-

- (1) Emesis
- (2) Gastric lavage

(1) Emesis (Vomiting):

- Vomiting is comparatively of greater value in avoiding the absorption of poison.
- Vomiting can be induced only if the medullary centers of the patient is still responsive, that is, in conscious patients.

Methods to Induce Vomiting :

- (a) Tickling the fauces
- (b) Intake of house hold emetics

Ex.- 1 teaspoon-mustard powder

2 table spoon-Common salt with 200 ml of water.

- (c) Other methods- Syrup of Ipecac-30ml for adult. Apomorphine, Copper sulphate, Tartar emetic, Zinc Sulphate etc.

Contraindication:

- Several heart & lung diseases
- Advanced pregnancy
- After ingestion of CNS stimulant
- Corrosives
- Strychnine
- Petroleum distillates
- Coma

Gastric Lavage (Stomach Wash) :

It is useful anytime within 3 hours after ingestion of a poison.

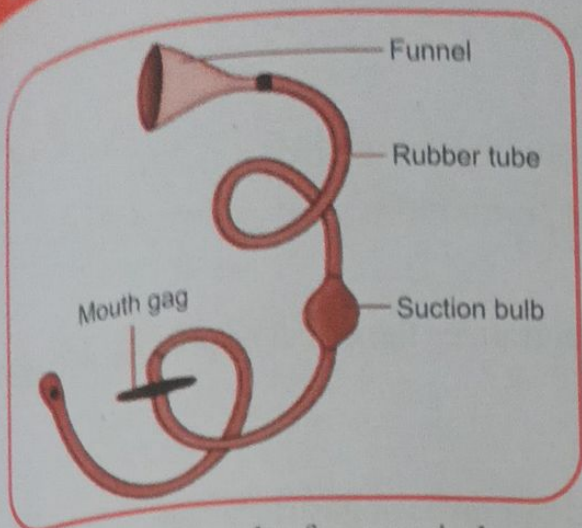
Instrument:

The instrument used to do the gastric lavage is -stomach tube (Ewald's or Boas tube)

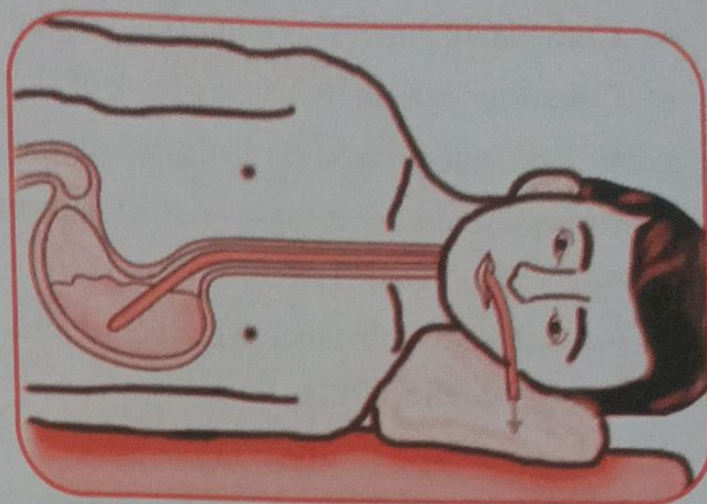
Stomach tube is made up of ordinary soft non collapsible rubber tube of one cm diameter & 1.5 m length with a filter funnel attached to at one end. It is marked at a level of 50cm from the lower end which is rounded with lateral opening. At midpart of tube there is a suction bulb (used to pump out the stomach contents). A wooden mouth gag is provided, one end of which is pointed, so that it can be forcefully inserted by the side of the mouth in non-cooperative patient.

Procedure:

- Patient should be placed in Trendelenburg position or in his left lateral decubitus position or semi prone with hips higher than his head & face downwards and mouth lower than larynx.
- Artificial dentures are removed & mouth gag is placed in between the teeth of two jaws (to avoid teeth bite).
- Care should be taken in unconscious patients who are likely to regurgitate the stomach contents which may aspirate into respiratory tract resulting in death from asphyxia.
- The round end of tube is lubricated with olive oil, glycerine or liquid paraffin and passed into the stomach by depressing tongue, and slowly passing it downwards through the pharynx & esophagus into stomach till 50 cm mark is reached (without force).



Ewald or Boas tube for gastric lavage



Patient positioned on left

- Absence of coughing & breath sounds in the funnel will confirm that the tube has not entered into the trachea.
- **Confirmation of tip in the stomach-** If the tube is in the stomach, a little air in a syringe is forced down the tube which can be heard as bubbling sound through a stethoscope applied over the stomach.
- After confirmation about 250 ml of warm water (35°C) should be passed through the funnel held high up above the patients head.
- The fluid enters the stomach by gravity.
- Now the funnel is lowered below the level of the patients stomach and the gastric contents emptied into a bowl by siphon action. The 1st wash is preserved for chemical analysis.
- The process is repeated until the returning fluid is of the same colour as the lavage fluid.
- Fluids used for gastric lavage include 1:5000 potassium permanganate, 5% Sodium bicarbonate, 1% Sodium/potassium iodide, 4% tannic acid, 1-3% calcium lactate, saturated lime water or starch solution or 0.9% saline.
- Approximately 10 litres of fluid is necessary for complete lavage.
- When poison has been completely removed, introduce some suitable antidote into the stomach to neutralize the effects of residual poison.
- Before stomach tube is withdrawn it should be pinched to prevent aspiration of material to the lungs.
- In children instead of stomach tube Ryle's tube or rubber catheter No.10-12 is used. (25cm length)

Contraindications of Gastric Lavage :

- Corrosive poisoning (except carbolic acid) owing to danger of perforation.

- Convulsant poison - as it may lead to convulsions.
- Comatose patient- because of risk of aspiration
- Volatile poison and Hydrocarbons - risk of aspiration pneumonitis
- Upper alimentary disease - risk of hemorrhage or perforation

(III) USE OF ANTIDOTES

Antidotes are substance which counteracts or neutralizes the effect of poisons without causing appreciable harm to the body.

Need for use of Antidotes:

- (a) A poison may not have been completely removed by emesis or gastric lavage.
- (b) In cases of contraindication of gastric lavage like acid poisoning.
- (c) The poison has been already absorbed.
- (d) The poison has been administered by rectal route or other than enteral routes.

Types of Antidotes:

According to mode of action they can be classified as-

1. Mechanical antidotes/Physical antidotes.
2. Chemical antidotes.
3. Physiological/pharmacological antidotes.
4. Universal antidote.

Mechanical/Physical Antidotes :

These are substances which prevent the accumulation of poison at the target organ by creating a mucus barrier.

Ex: Demulcents, bulky food, activated charcoal.

Activated Charcoal:

Activated charcoal is a fine black odourless powder produced by destructive distillation of various organic materials, usually wood pulp & then treating at high temperatures with activating agents to increase its adsorptive capacity. This activated charcoal acts mechanically by adsorbing and retaining in its pores organic and less degree mineral poisons like barbiturates, atropine, strychnine, digitalis etc, forming a charcoal toxin complex to be evacuated with stool.

Dose- It is normally given in dose of 60-100 gms in adults mixed with 8 ml of diluent or water per gm of charcoal water.

Demulcents :

Demulcents are substances which prevent the absorption of poison by forming a coating on mucus membrane of stomach. It is indicated in both irritant & corrosive poisons.

Ex: Fat, oil, milk, egg albumin, milk of magnesia.

Bulky Food :

These acts as mechanical antidotes to glass powder by imprisoning its particle within its meshes and thus prevent the damage.

Ex: Banana.

Chemical Antidotes :

They counteract the action of poison by forming a harmless or insoluble compound or by oxidizing poison when they are brought into contact with them.

Ex:

- (a) Dilute acetic acid or vinegar neutralizes the alkalis.
- (b) Dilute alkalis like milk of magnesia will neutralize acids.
- (c) Potassium permanganate is an oxidising agent that reacts well with organic substances. It is effective against all oxidizing poisons like phosphorous cyanides etc.
- (d) Common salt for silver nitrate.
- (e) CuSO_4 for phosphorus.
- (f) Tannic acid or strong tea in strychnine, aconite, mercury, copper etc poisoning.

Physiological/Pharmacological Antidotes :

They act on the tissues of the body and produces symptoms exactly opposite to those caused by the poisons. These are used after the poison is absorbed into the circulation.

They mainly act on the principle of antagonism.

Ex: Atropine for physostigmine

Diazepam for strychnine

Strychnine for barbiturates

Amyl nitrates for cyanides etc.

Chelating Agents :

They are specific antidotes against some heavy metal poisoning. They produce a firm non ionised cyclic complex called chelate with cations. The complex of agent & metals is more water soluble resulting in higher renal excretion.

(a) B.A.L.- British Anti-Lewisite/Dimercaprol :

- It is used as antidotes in certain heavy metal poisoning like arsenic, lead, copper, mercury, gold etc.
- **Actions :** Many heavy metals have a great affinity for sulphhydryl (SH) radical & combines with them in tissue and deprive the body of the use of respiratory enzymes of tissue cells.

- B.A.L. has 2 unsaturated SH group which combines with the metal & thus prevent the union of metal with the SH group of the respiratory enzyme system. The compound formed by heavy metals & BAL is stable, is carried to tissue fluid & excreted in urine.
- **Dose-** 3-5 mg/kg body weight given as deep IM injection every 4 hourly for 2 days, 6 hourly on 3rd day & 12 hourly for 10 days.
- It is contraindicated in extensive liver damage.

(b) E.D.T.A. (Ethylene Diamine Tetra-Acetic Acid) :

It is extensively used chelating agent in case of arsenic, lead, mercury, cobalt, nickel poisoning.

Actions- It forms chelates with metals which are water soluble & non toxic & excreted in urine.

Dose- 25-35mg/kg body weight in slow IV infusion with normal saline, twice daily up to 5 days.

Contraindications- Renal damage.

(c) Penicillamine :

It is a hydrolysis product of penicillin. It has a stable (SH) group, useful in poisoning from lead, gold, copper mercury etc.

Dose: 30 mg/kg body weight maximum upto total of 2 gm/day in 4 divided doses orally for 7 days.

Universal Antidote :

When exact poison ingested is not known or when a combination of 2 or more poison is suspected, universal antidote is given.

It consists of a combination of readily available substances as follows.

Constituents	Quantity	Purpose
Powdered charcoal	2 part	Adsorbs alkaloids
Megnesium oxide (milk of megnesia)	1 part	Neutralises acids
Tannic acid (Strong acid)	1 part	Precipitates alkaloids, glycosides and metals

Dose- A tablespoon full is mixed with 200 ml of water and given orally. It may be repeated once or twice. It is not very effective.

(IV) ELIMINATION OF ABSORBED POISON BY EXCRETION :

Indications :

1. In severe poisoning
2. Progressive deterioration inspite of full supportive care.
3. When there is high risk of serious morbidity or mortality

4. When normal route of excretion of poison is impaired.
5. When poison produces delayed but serious toxic effects.
- (1) **Renal excretion:** This may be achieved by giving large amounts of fluid, tea or lemonade orally.
- (2) **Purging:** 30g of NaSO_4 with large quantity of water hastens the elimination of poison in stool.
- (3) **Whole bowel irrigation:** It involves the use of polyethylene glycol given orally or by nasogastric tube. It is usually administered continuously until rectal effluent is clear. It takes about 2-4 hrs. It is useful in patients who have ingested large quantity of substances that are difficult to remove. Eg: iron, heroin, cocaine etc.
- (4) **Peritoneal dialysis:** Indicated in poisoning of alcohol, long acting barbiturates, mercury.
- (5) **Haemodialysis:** This has been employed for removal of poisons which are water soluble, have low molecular weight and are protein binding substances like barbiturates, acids, ethanol, methyl alcohol, salicylates etc from blood.
- (6) **Haemoperfusion:** Suggested for removal of lipid soluble drugs which are highly protein bound like barbiturate, digitalis, paracetamol etc.
- (7) **Diaphoretics:** It is the process of excretion of toxic agents by creating profuse perspiration in the patient.

(V) TREATMENT OF GENERAL SIGNS & SYMPTOMS

General measures must be adopted to support the life of the patient and to lessen his/her suffering. Pain, shock, peripheral circulatory collapse, water & electrolyte disturbance, asphyxia, coma, convulsions, anuria, hepatic failure, respiratory infections have to be taken care of.

- Morphine should be given for pain.
- Oxygen or artificial respiration for respiratory failure.
- Cardiac stimulants for failing circulation.
- Anesthetics, barbiturates for convulsions.
- Saline infusion may be useful to counteract dehydration, to enhance diuresis & to excrete toxic substances.
- Administration of glucose to combat liver glycogen and restoration of K^+ & Na^+ balance.
- Cover the patient with blankets to counteract shivering.

- Keep the head at a lower level than the feet by elevating foot end of the bed.
- Hypovolemic shock due to dehydration managed by blood transfusion or 500ml of blood plasma or its substitutes like dextran followed by 5% glucose with normal saline.
- If there is anuria/oliguria it is safe to give 5-10% of glucose solution.
- For marked peripheral circulatory failure, noradrenaline drip may be used & the blood pressure is watched.
- In case of anaphylactic shock-adrenaline, antihistamine & corticosteroids are necessary.
- In case of coma-respiration is supported by mechanical aids.
- In case of asphyxia: In unconscious patients airway should be kept unobstructed. Fingers/suction should be used to remove vomitus/mucus. Mouthgag should be used to keep the mouth open, head should be kept sideways.

Duties of Medical Practitioner in Case of Suspected Poisoning

The duties of a doctor in a case of suspected poisoning has two parts:

1. Medical duty: Care and treatment of the patient
2. Medico-legal duty: Proper medico-legal documentation and preservation of samples to assist the investigating agency in relation to poisoning

Medical Duties

- Every hospital (Government or private) is under a legal obligation to treat all cases of poisoning irrespective of the nature or manner of poisoning.
- No case can be turned away and the life of patient must be saved by exercising reasonable skill and care.
- If adequate facilities are not available, first aid treatment or whatever is best available must be given and the patient referred to the nearest referral hospital.
- If the nature of poisoning is known, immediate appropriate treatment should be instituted and if not known, general line of treatment of poisoning as discussed already is applied.

Legal Duties

1. Inform the Nearest Magistrate/Police Officer:

- Government doctors have to report all cases of poisoning, whether accidental, suicidal or homicidal to the nearest police or magistrate. It is generally reported in all text books that the private doctors can report only the homicidal poisoning cases and are under no legal obligation to report the suicidal/accidental poisoning cases to the police.

- Anyhow, as per Sec. 39 CrPC it is the duty of the public to give information of commission of certain offences of IPCs mentioned under 39 CrPC, which includes Sec. 302, 303 and 304 IPC (that is to say offences affecting human life), to the nearest magistrate/ police officer. Hence it is prudent and safe advice that all cases of poisoning, irrespective of the manner, whether accidental, suicidal or homicidal should be reported to the police.
- The doctor can call the nearest police station and inform about the case and note down the police diary number for future reference with date and time on the register maintained by the hospital or by himself.
- If the doctor fails to inform the magistrate/police, it is a punishable offence under **Sec. 176 IPC** (Imprisonment of 1 month or fine of Rs.500/- or both).
- If the police require information's regarding the case, the doctor must divulge all information's. There is no scope for professional secrecy (Sec 175 CrPC).
- If no information is given or wrong information is given deliberately, he becomes culpable under Sec 202 and 193/177 IPC respectively.
- If it is a case of food poisoning which may be accidental, originating from a public eatery like hotel, canteen or public function (marriage/festival dinner), it should be reported to the public health authority so that suitable preventive steps can be taken.

2. Dying Declaration:

- If the patient is in serious condition and may die the doctor should inform the nearest magistrate to record the dying declaration.
- If there is no time to wait for magistrate, he should record the dying declaration himself in the presence of an independent witness like nurse or emergency staff.

3. Detailed Medico-Legal Documentation and Proper Maintenance of Records:

- The attending doctor should record all the findings and prepare a proper MLC report.
- He must record the preliminary particulars i.e, full name, age, sex, occupation, date and time, brought by whom and history of dying declaration whether necessary or not.
- In case of suspected poisoning, the diagnosis should not be mentioned as unknown poisoning. In such case, if its nature of poisoning is not clear, it should be mentioned as poisoning nature not known.
- Ask proper history of the nature of poisoning/ amount/time of consumption/route of consumption /previous suicidal attempt/drug abuse/psychiatric illness/ any disease etc from the patient/relatives/ eye witness.

- Sometimes the relative will bring the remnant of the poison consumed. It should be properly recorded in the MLC and forwarded to the investigating officer in a sealed condition with proper label to be tested in the Forensic Science laboratory.
- The MLC records should be kept in a safe custody as per the hospital protocol. Otherwise the doctor has to maintain his personal record of the MLC cases dealt by him.

4. Preservation of Sample:

- In poisoning cases blood and urine are the sample of choice. It can be collected in a clean glass or plastic container as discussed already.
- The attending physician should collect all the available relevant samples for evidence of poisoning such as vomitus, gastric lavage, urine, faeces, clothes stained with vomitus/fluid etc.
- In case of food poisoning the doctor should collect the contaminated food.
- All the samples should be properly sealed, labelled (name of the patient, material preserved, date and time) signed and handed over to the investigation officer for onward transmission to the FSL for toxicological analysis.
- He also must preserve other evidence of poisoning like bottle/cup/tumbler used, clothe or bed sheets stained by the vomit/urine/faeces or poison container for possible future examination and corroboration.
- Many a times the doctor may be careless, not knowing its legal implications. If the doctor intentionally fails to preserve the samples, he is liable to be punished under Sec. 201 IPC (causing disappearance of evidence).

5. Recommend for Medico-Legal Postmortem in Case of Death:

- If the patient dies of suspected poisoning or was brought dead to the hospital the doctor should not issue a death certificate. The police should be informed and the deceased body should be forwarded for medico-legal postmortem to ascertain the poison and the exact cause of death.

6. Opinion in Poisoning Cases:

- The opinion in cases of death due to suspected poisoning or patient survived of suspected poisoning should be given carefully.
- The investigating officer will seek the medico legal opinion on the case from the treating doctor in non fatal cases or from the doctor who conducted the post-mortem in fatal cases.
- The doctor has to interpret the toxicology report considering its physiological

effects/clinical manifestation on the body in relation to the concentration and the postmortem findings before giving his opinion.

7. Chronic Poisoning Case:

- The doctor has to be aware of the chronic poisoning cases in his area.
- Certain cases like chronic arsenic poisoning have been reported in certain parts of India due to high level of arsenic in the ground water.
- It gets deposited in the body after many years of people consuming contaminated water leading to skin manifestation or systemic disorder.
- When such poisoning comes into his knowledge it his duty to report it to the concerned public authority, so that action can be taken to prevent the damage.

Important Questions:

Short Answers:

1. Define Forensic medicine and Toxicology.
2. Describe the routes of administration of a poison.
3. Universal antidote.

Short Essay:

1. Describe the duties of a medical practitioner in case of suspected poisoning.
2. Gastric Lavage.
3. Types of antidotes.
4. Classification of poisons.

Long Question:

1. Define a poison. Illustrate the features of an ideal suicidal and homicidal poison. Describe in detail the types of antidotes used in the treatment of a case of poisoning.
2. Describe in detail the principles of treatment of poisoning.

Origin and Classification of Visha

Origin of Visha : विष योनिः

जङ्गमं स्थावरायां तद्योनौ ब्रह्म अन्ययोजयत् ।।

तदम्बु संभवं तस्मात् द्विविधं पावकोपमम् ।। (च.चि. २३/६)

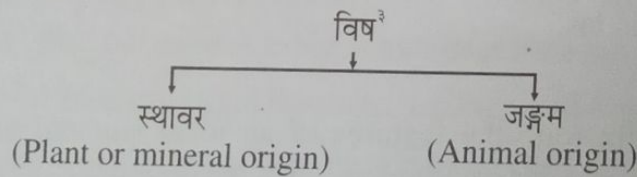
Lord Brahma deposited this poison, which originated from water and resembles fire, in jangama and sthavara visha.

- Visha gets aggravated in varsha ritu as it is ambu sambhava or originated from water and as the yoni of visha is water, visha gets pacified by the effect of water¹.
- Also because the origin of visha is water, it becomes sticky like jaggery when it comes in contact with water and spreads during the rainy season².

विष वर्गीकरण - Classification of Visha :

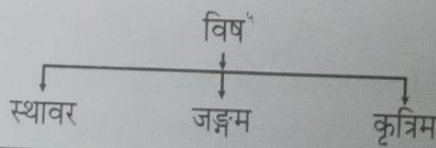
There are various references for the classification of visha in Ayurveda. Different Acharyas have classified it as:

1. Acharya Charaka :



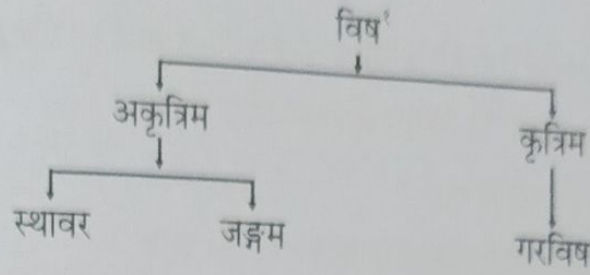
- He has also mentioned about गर/संयोगविष^४

2. Acharya Sushruta :

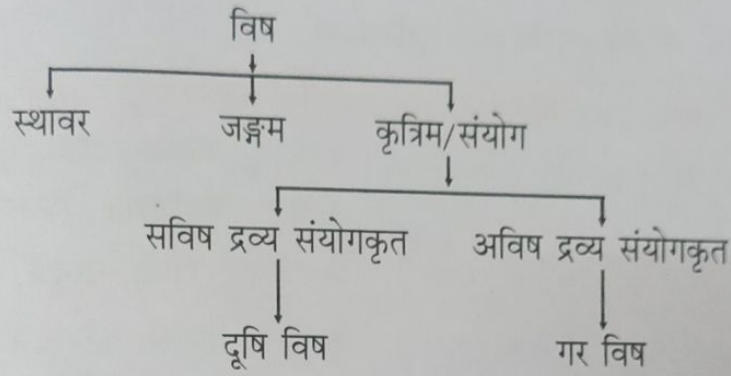


१. अम्बु संभवत्वेन चाक्य वर्षा प्रकोपित्वं वक्ष्यमाण युक्तम्;
अम्बु योनिभूतत्वेन चास्य जलेन प्रभावात् प्रशमनं क्रियत इति ज्ञेयम् (चक्रपाणि on च.चि. २३/६)
२. तद्वर्षासु अम्बुयोनित्वात् संक्लेदं गुडवद्वत्तम् ।। (च.चि. २३/७)
३. जङ्गमं स्थावरायां तद्योनौ ब्रह्मान्ययोजयत् । (च.चि. २३/६)
४. गर संयोगजं चं अन्यात् गर संज्ञं गद प्रदम् । (च.चि. २३/१४)
५. स्थावरं जङ्गमं यच्च कृत्रिमं च अपि यद्विषम् । (सु.क. २/२४)

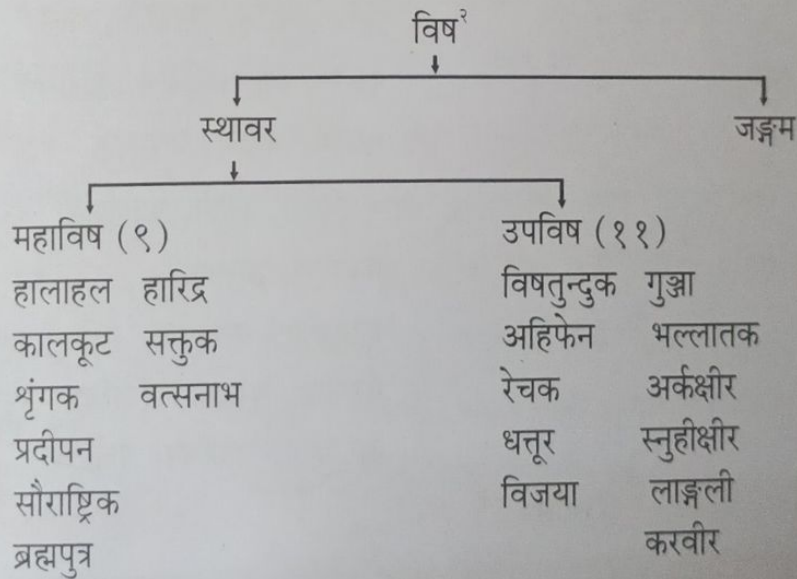
3. Acharya Vagbhata :



4. According to वृद्ध काश्यप :



5. According to रसतरंगिणि :



Source of Visha (विष अधिष्ठान)

- The place where visha gets originated or where it lodges itself or the media through which it gets manifested is called as visha adhishtana or the source of visha.

१. स्थावरं जङ्गमं चेति विषं प्रोक्तमकृत्रिमम् । कृत्रिमं गरसंज्ञं तु क्रियते विधौषधैः ॥ (अ.ह.उ. ३५)
 २. विषं क्ष्वेडञ्च गरलं कालकूटश्च तन्मतम् । स्थावरं जङ्गमचेति द्विविधं विषमुच्यते ॥
 विषं च उपविषं चेति द्विविधं स्थावरं विषम् । प्रथमं वत्सनाभादि द्विविधं तिन्दुकादिकम् ॥ (र.त. २४/२)

- Visha is broadly classified as sthavara and jangama and these two categories have their own adhishtanas.
- 10 sources have been described for sthavara visha and 16 for jangama visha.

Source of Sthavara Visha (स्थायर विष अधिष्ठान) :

मूलं पत्रं फलं पुष्पं त्वक् क्षीर सार एव च।

निर्यासो धातवश्चैव कन्दश्च दशमः स्मृतः॥ (सु.क. २/४)

- Sthavara visha have 10 different sources with several examples for each. The 10 sources include : root, leaf, fruit, flower, bark, milk, pith, gum, mineral and bulb.
- In total 55 sthavara visha have been explained¹.

S.N.	Adhistana	Number	Examples
१.	मूल	८	क्लीतक, अश्वमार, गुञ्जा, सुगन्ध, गर्गरक, करघाट, विद्युच्छिखा, विजया
२.	पत्र	५	विषपत्रिका, लम्बा, वरदारु, करम्भ, महाकरम्भ
३.	फल	१२	कुमुद्वती, वेणुका, करम्भ, महाकरम्भ, कर्कोटक, रेणुक, खद्योतक, चर्मरी, इभगन्धा, सर्पघाती, नन्दन, सारपाक
४.	पुष्प	५	वेत्र, कादम्ब, वल्लीज, करम्भ, महाकरम्भ
५.	त्वक्, सार,	७	अन्नपाचक, कर्तरीय, सौरीयक, करघाट,
७.	निर्यास		करम्भ, नन्दन, नाराचक
८.	क्षीर	३	कुमुदघ्नी, स्नुही, जालक्षीरी
९.	धातु	२	फेनाशम, हरताल
१०.	कन्द	१३	कालकूट, वत्सनाभ, सर्षप, पालक, कर्दमक, वैराटक, मुस्तक, शृङ्गीविष, प्रपुण्डरीक, मूलक, हालाहल, महाविष, कर्कटक

Total=55

जङ्गमविष अधिष्ठानः Jangama Visha Adhistana

The sources of jangama visha are 16- sight, breath, teeth, nails, urine, stool, semen, saliva, menstrual blood, bristles, flatus, bones, bile, sting and deadbody.

१. तत्रक्लीतकअश्वमारगुञ्जासुगन्धगर्गरककरघाटविद्युच्छिखाविजयानीत्यष्टौमूलविषाणि, विषपत्रिकालम्बावरदारु करम्भमहाकरम्भाणिपञ्चपत्रविषाणि; कुमुद्वतीवेणुकाकरम्भमहाकरम्भकर्कोटकीरेणुकाखद्योतकचर्मरीइभ-गन्धासर्पघातीनन्दनसारपाकानीतिद्वादशफलविषाणि; वेत्रकादम्बवल्लीजकरम्भमहाकरम्भाणिपञ्च-पुष्पविषाणि; कुमुदघ्नीस्नुहीजालक्षीरीणि त्रीणि क्षीरविषाणिफेनाशमहरतालचद्वेधातुविषे; कालकूटवत्सनाभ सर्षपपालककर्दमकवैराटकमुस्तकशृङ्गीविष प्रपुण्डरीकमूलकहालाहलमहाविष कर्कटकानीति त्रयोदशकन्दविषाणि; इत्येवंपञ्चपञ्चाशत्स्थायरविषाणिभवन्ति॥ (सु.क. २/५)

तत्रदृष्टि निःश्वास दंष्ट्रा नख मूत्र पुरीष शुक्र लाला आर्तव मुखसंदंश विशर्धित तुण्ड अस्थि पित्त शुक्र शवानीति॥ (सु.क. ३/४)

S.N.	Adhistana	Examples
१.	दृष्टि ^१	दिव्य सर्प
२.	निःश्वास	दिव्य सर्प
३.	दंष्ट्रा	भौम सर्प, मार्जार, अश्वानर, मकर, मण्डूक, पाकमत्स्य, गोधा, शम्बूक, प्रचालक, गृहगोधिका, चतुष्पादकीट
४.	नख	मार्जार, अश्वानर, मकर, मण्डूक, पाकमत्स्य, गोधा, शम्बूक, प्रचालक, गृहगोधिका, चतुष्पादकीट, लूता
५ ६.	शकृत्/पुरीष मूत्र	चिपिट, पिच्चिटक, कषायवासिक, सर्षपक, नोटक, वर्चःकीट, कौण्डिन्यकाः, लूता and others described under विषर्धित
७.	शुक्र	मूषिका, लूता
८.	लाला	लूता
९.	आर्तव	लूता
१०.	मुखसंदंश सारिकामुखा,	लूता, चित्रशिरः सराव, कुर्दि, शतदारुक, अरिमेदक, मक्षिका, कणभ, जलायुका
११.	विशर्धित	चित्रशिरः, सराव, कुर्दि, शतवारुक, अरिमेदक, सारिकामुखा
१२.	तुण्ड	उच्चिङ्गि, वरटी, शतपदी, शूक, वल्लभिका, शृङ्गि, भ्रमराः
१३.	अस्थि	विषहतास्थि, सर्पकण्टक, वरटीमत्स्य अस्थि
१४.	पित्त	शकुली मत्स्य, रक्तराजि, वरटीमत्स्य
१५.	शूक/आर ^२	वृश्चिक, विश्वम्भर, वरटी, राजीवमत्स्य, उच्चिटिङ्गाः, समुद्र वृश्चिका
१६.	शव	कीट-सर्प मृत देह

१. तत्रदृष्टि निःश्वासविषादिव्याः सर्पाः, भौमास्तुदंष्ट्राविषाः, मार्जारअश्वानरमकरमण्डूकपाकमत्स्य-गोधाशम्बूकप्रचालकगृहगोधिकाचतुष्पादकीटस्तथाऽन्येदंष्ट्रानखविषाः, चिपिटपिच्चिटककषायवासिक सर्षपकनोटकवर्चःकीटकौण्डिन्यकाः शकृन्मूत्रविषाः, मूषिकाः शुक्रविषाः, लूतालालामूत्रपुरीष मुखसन्दंशनखशुक्रार्तवविषाः, वृश्चिकविश्वम्भरवरटीराजीवमत्स्यउच्चिटिङ्गाः समुद्र वृश्चिकाश्चरविषाः, चित्रशिरः सरावकुर्दिशतदारुकारिमेदकसारिकामुखमुखसन्दंशविशर्धितमूत्रपुरीष विषाः, मक्षिकाकणभ-जलायुकामुखसन्दंशविषाः, विषहतास्थिसर्पकण्टकवरटीमत्स्यास्थिचेत्यस्थिविषाणि, शकुलीमत्स्य-खतराजिवरटीमत्स्याश्चपित्तविषाः, सूक्ष्मतुण्ड उच्चिटिङ्ग वरटीशतपदीशूकवल्लभिकाशृङ्गि भ्रमराः शूकतुण्ड विषाः, कीटसर्पदेहागतासवः शवविषाः शेषास्त्वनुक्तामुखसन्दंशविशेष्वेवगणयितव्याः॥ (सु.क. ३/५)
२. आरशब्देनात्र वृश्चिकलाङ्गुलादिस्थितः कण्टकोभण्यते, तस्यचस्थूलशूक रूपत्वात्शूक ग्रहणैर्नैव ग्रहणम्। अत एवदृष्टि निःश्वासेत्यादिमूत्रे पृथक्नउदाहृतमार ग्रहणम्। (डल्हणदहसु.क. ३/५)

Difference between Visha, Madya and Oja Guna:

विष गुण	मद्य गुण	ओज गुण
लघु	लघु	गुरु
रूक्ष	रूक्ष	स्निग्ध
आशु	आशु	स्थिर
विशद	विशद	पिच्छिल
व्यवायि	व्यवायि	प्रसन्न
तीक्ष्ण	तीक्ष्ण	मृदु
विकासी	विकासी	श्लक्ष्ण
सूक्ष्म	सूक्ष्म	बहल
उष्ण	उष्ण	शीत
अनिर्देश्य रस	अम्ल रस	मधुर रस

विष गुण :

लघु रूक्षम् आशु विशदं व्यवायि तीक्ष्णं विकासि सूक्ष्मम् च
उष्णम् अनिर्देश्यरसं दशगुणमुक्तं विषंतज्ज्ञैः ।। (च.चि. २३/२४)

मद्यगुण :

लघु उष्ण तीक्ष्ण सूक्ष्म अम्ल व्यवाय्याशुगमेव च ।
रूक्षं विकासी विशदं मद्यं दशगुणं स्मृतम् ।। (च.चि. २४/३०)

ओजोगुण :

गुरु शीत मृदु श्लक्ष्णं बहलं मधुरं स्थिरम् ।
प्रसन्नं पिच्छिलं स्निग्धम् ओजो दशगुणं स्मृतम् ।। (च.चि. २४/३)

The gunas of visha and madya are almost similar, but of visha and ojas are opposite to each other.

Difference Between Visha Guna and Madyaguna:

Visha and madya have 10 gunas each. Almost all the gunas are similar to each other except for the rasa. Visha has anirdishya rasa whereas madya has amla rasa.

Difference between Visha and Oja Guna:

Visha and madya which have almost similar gunas are exactly opposite to the gunas of ojas.

विष उपद्रव (Complications of Visha)

ज्वर कास वमि श्वास हिध्मा तृष्णा अतिमूर्च्छनम् । विशोभेदो अतिकाठिन्यम् आनाहो बस्तिमूर्द्धरुक् ।।
श्वयथुः पूतिदंशत्वं रक्तस्रावो विषानिलः ।। इति षोडश निर्दिष्टा विषार्तानामुपद्रवाः ।। (अ.सं. ४७/३)

The following are the 16 complications of Visha

१. ज्वर	-	Fever	९. अतिकाठिन्य	- Hard faeces
२. कास	-	Cough	१०. आनाह	- Flatulence
३. वमि	-	Vomiting	११. बस्तिरुक्	- Pain in bladder region
४. श्वास	-	Dyspnoea	१२. मूर्धरुक्	- Pain in the head
५. हिध्मा	-	Hiccup	१३. श्वयथु	- Swelling
६. तृष्णा	-	Severe thirst	१४. पूतिदंशत्वं	- Foul smell from bite site
७. अतिमूर्च्छनम्	-	Severe fainting	१५. रक्तस्राव	- Bleeding
८. भेद	-	Diarrhoea	१६. विषानिल	- Aggravation of vata from poison.

Acharya Charaka States the Upadravas as :

विष वेगात् मद मूर्च्छा विषाद हृदयद्रवाः प्रवर्तन्ते॥ (च.चि. २३/४३)

As a result of spreading of poison the following complications can be seen.

मद	-	intoxication
मूर्च्छा	-	fainting
विषाद	-	depression
हृदयद्रवाः	-	palpitation

Acharya Charaka explains the signs indicating death in a poisoned patient, which may also be considered as the complications of visha, these include¹:

नीलौष्ठ	-	Bluishness of lips
दन्तशैथिल्य	-	looseness of teeth
केशपतन	-	falling of hair
अङ्गभङ्ग	-	breaking of limbs
विक्षेप	-	stiffening of body parts
शिशिरैर्न लोमहर्षो	-	absence of horripilation even if touched by cold things.
न अभिहते दण्डराजीस्यात्	-	non formation of contusion marks in the body in reaction to blows
क्षतजं क्षताच्च न यात्	-	absence of bleeding from wounds.

विष मुक्तलक्षणा's

विषमुक्त लक्षणा's are those which indicate that the person is free from विष. After Appearance

१. नीलौष्ठ दन्तशैथिल्यकेशपतनअङ्गभङ्ग विक्षेपाः। शिशिरैर्नलोमहर्षोनाभिहतेदण्डराजीस्यात्।
क्षतजं क्षताच्चनायात्येतानिभवन्तिमरणलिङ्गानि॥ (च.चि. २३/३३)

of these लक्षणा's further treatment is not required.

These विषमुक्त लक्षणा's are explained by Acharya Sushruta as :

प्रसन्न दोषं प्रकृतिस्थ धातुम् अन्नाभिकाङ्क्षं सममूत्रं विट्कम्।

प्रसन्न वर्णोऽन्द्रियं चित्तचेष्टं वैद्योऽवगच्छेत् अविषं मनुष्यम्॥ (सु.क. ६/३२)

प्रसन्नदोष-	दोष साम्यता- Doshas are in equilibrium state and their functions are in normalcy.
प्रकृतिस्थ धातु	Normal functioning of धातु's, which nourishes the body.
अन्नाभिकाङ्क्षं	The person will be having good appetite or person desires for food.
सममूत्रं विट्कम्	The proper elimination of पुरीष and मूत्र.
प्रसन्न वर्णं	Normal complexion.
प्रसन्न इन्द्रियं	Normal functioning of sense organs.
प्रसन्न चित्तं	Proper functioning of mind.
प्रसन्न चेष्टं	Normal activities.

In some text books of Sushruta Samhita instead of the word सममूत्रं विट्कं the word समसूत्रं जिह्वम् is used which means that the perception of taste returns to normalcy.

If all these qualities are present the physician can decide that the person is free from visha.

Acharya Vagbhata has used the term- 'आहारकामं' instead of अन्नाभिकाङ्क्षं while explaining the visha mukta lakshana¹.

Important Questions:

Short Answers or Short Essay:

1. Classification of visha.
2. Visha Adhishtana.
3. Visha upadrava.
4. Visha Mukta Lakshana.
5. Difference between Visha, Madya and Ojo guna.



१. प्रशान्तदोषं प्रकृतिस्थ धातुमाहारकामं सममूत्रं विट्कम्।

प्रसन्नवर्णोऽन्द्रियं चित्तचेष्टं वैद्योऽवगच्छेत् अविषं मनुष्यम्॥ (अ.सं.उ. ४७/४६)

Test for Detection of Visha

विष परीक्षा

The examination of poisoning as explained in the samhitas can be understood as follows:-

1. Panchabhoutika Pariksha : पञ्चभौतिक परीक्षा¹:

Panchamahabhutas are the basis of evolution of the world and the visha dravyas are not an exception for the same. The specific characters of shabda, sparsha, roopa, rasa and gandha are present in the visha dravyas and hence the examination of poison can be done based on these characters.

Shabda Pareeksha (शब्द परीक्षा):

हुतभुक् तेन चाग्नेन भृशं चटचटायते। (सु.क. १/२९)

When the poisoned food is put on fire, it burns with a cracking sound.

Sparsha Pareeksha (स्पर्श परीक्षा):

पाणिग्राप्तं पाणिदाहं नखशातं करोति च। (सु.क. १/३७)

When poison comes in contact with the hand, it produces burning sensation in the hand* and falling of the nails.

Roopa Pareeksha (रूप परीक्षा):

मयूर कण्ठ प्रतिमो जायते चापि दुःसहः। (सु.क. १/२९)

On contact of poisoned food with fire, fumes come up with the colour of the neck of peacock (blue) and are unbearable.

Rasa Pareeksha (रस परीक्षा):

नृपभक्ताद्वलिं न्यस्तं सविषं भक्षयन्ति ये। तत्रैव ते विनश्यन्ति मक्षिकावायसादयः॥ (सु.क. १/२९)

Animals like flies, crow etc which eat the poisoned food die immediately.

Gandha Pareeksha (गन्ध परीक्षा):

भिन्नार्चिस्तीक्ष्ण धूमश्च नचिरोच्चोपशाम्यति। (सु.क. १/३०)

The fumes coming up when poisoned food is put into fire are found broken (i.e not

१. रस रूपादिभिस्तल्लिङ्गमुद्दिशन्नाह नृपभक्तादित्यादि।..... एवं शब्दादिभिः पञ्चाभि (चतुर्भि) विषज्ञानं प्रतिपाद्यापरेणापि प्रकारेण चकोरादि पक्षिमृग चक्षुरादि विकारेण विषज्ञानमुद्दिशति। (डल्हण दह सु.क. १/२९-३३)

continuous), strong and do not subside soon.

2. Testing on Animals and Birds:

चकोरस्य अक्षिवैराग्यं जायते क्षिप्रमेव तु। (सु.क. १/३०)

On seeing the poisoned food the eyes of the chakora bird soon gets discolored.

दृष्टान्नं विषसंसृष्टं म्रियन्ते जीवजीवकाः॥ (सु.क. १/३०)

On seeing the poisoned food jeeva jeevaka bird dies.

कोकिलः स्वर वैकृत्यं—The voice of nightingale becomes abnormal.

कौञ्चस्तु मदमृच्छति—The krauncha bird gets intoxicated.

हृष्येन्मयूर उद्विग्न—The peacock which is otherwise cheerful becomes agitated.

कोशतः शुकसारिके—Parrot and maynah birds cry aloud with fear.

हंसः क्ष्वेडति चात्यर्थ—Swan makes more sound.

भृङ्गराजस्तु कूजति—The bhrangaraja bird hoots.

पृषतो विसृजत्यश्रुं—The spotted deer sheds tears.

विष्ठां मुञ्चति मर्कटः—Monkey defecates.

3. Examination based on Symptoms (लक्षणानुसार परीक्षा):

Jangama Visha Lakshana:

निद्रां तन्द्रां क्लमं दाहं सपाकं लोमहर्षणम्। शोफं चैवातिसारं च जनयेज्जङ्गमं विषम्॥ (च.चि. २३/१५)

When a person exhibits symptoms like excessive sleep, drowsiness, mental fatigue, burning sensation, inflammation, horripitation, oedema and diarrhoea, it is to be diagnosed as a case of jangama visha.

Sthavara Visha Lakshana:

स्थावरं तु ज्वरं हिक्कां दन्तहर्षं गलगृहम्। फेनवम्यरुचिं श्वास मूर्च्छांश्च जनयेद्विषम्॥ (च.चि. २३/१६)

Sthavara visha produces symptoms like fever, hiccup, tingling sensation in teeth, obstruction in the throat, emitting froth from the mouth, anorexia, dyspnea and fainting.

Modern Toxicological Techniques for Detection of Poisons:

The following are a few of the modern analytical techniques which may be used for qualitative and quantitative analysis of poisons.

1. Chromatography:

There are different types of chromatography procedures; the commonly used are thin layer chromatography (TLC) and gas liquid chromatography (GLC). In both these, the test sample is carried by two phases - the mobile phase and the stationary phase. The components present in the test sample migrate with different rates and get separated. In TLC the separated compound is identified by the colour reactions with different chromogenic reagents.

Electron capture and ultra violet detectors are used in GLC. TLC is suitable for non-volatile compounds whereas GLC is suitable for volatile compounds.

High pressure liquid chromatography (HPLC) is a more sophisticated gadget working on the same principles but here, the mobile phase runs under high pressure and the efficacy of the technique is tremendously increased.

2. Mass Spectrometry:

In a mass spectrometer, the sample is bombarded with a beam of electron. This results in the production of charged molecules or ionic fragments of the sample. The charged particles are then separated and identified. Usually, compounds captured from GLC column are passed into a mass spectrometer.

3. Spectrophotometry:

A poisonous compound may absorb or emit radiant energy. Depending on the different components of a poison, it absorbs radiation of different wavelengths. Spectrophotometer consists of a radiation source, a monochromater, a sample cell and a detector to measure the absorption of different radiation at various wavelengths.

4. Immunoassay:

Immunological techniques have recently been introduced in toxicology. These are based on antibody-antigen reaction which is very sensitive and specific. It may be used both for qualitative and quantitative analysis. A labelled antigen or antibody is utilised in this method. The commonly used label is a radioisotope.

Non-isotopic labels have also been used like-

Enzyme mediated immunoassay - EIA.

Erythrocyte- Haemagglutination Inhibition Assay.

Bacteriophage- Viro immunoassay

Fluorescent group and Stable free radical- FRAT, spin immunoassay.

Among all the above, the enzyme immunoassay are more commonly used.

Radioimmuno Assay (RIA):

It is a very sensitive in vitro assay technique used to measure concentrations of antigens (for example, hormone levels in the blood) by use of antibodies. In RIA, a known quantity of an antigen is made radioactive, frequently by labeling it with gamma-radioactive isotopes of iodine. It is then mixed with a known amount of antibody for that antigen as a result of which the two specifically bind with one another. Then, a sample of serum from patient containing an unknown quantity of that same antigen is added. This causes the unlabeled (cold) antigen from the serum to compete with the radiolabeled antigen (hot) for antibody binding sites. As the concentration of unlabeled antigen is increased, more of it binds to the antibody,

displacing the radiolabeled variant and reducing its ratio. The bound antigens are then separated from the unbound ones and the radioactivity of found antigens remaining in the supernatant is measured using a gamma counter.

Ex: It is used to assess levels of bhang, digoxin, L.S.O., paraquat etc in the given samples.

- Other techniques like enzyme mediated immunological technique (EMIT), Neutron activation analysis etc are also used in the quantitative analysis of poisons.
- For the qualitative analysis, colour tests and TLC is generally used.
- Colour tests may include the marquist test, trinders test, ferric chloride tests, dichromate tests, reinsch test and so on.

विष दात लक्षण

An intelligent physician can identify and ascertain the poisoner based on the expression, speech and conduct shown by him. There are different references of the visha daata lakshana in our Samhitas:

विषदः श्याव शुष्कास्य विलक्षो वीक्षते दिशः ।

स्वेद वेपथु मांस्त्रस्तो भीतः स्खलति जृम्भते ।। (अ.ह.सू. ७/१२-१३७)

The person who induces poison has all the following features.

श्याव अस्य	-	Discolored face.
शुष्कास्य	-	His mouth will be dry out of anxiety.
विलक्ष	-	Shy by nature
दिशः वीक्षते	-	Looks here and there aimlessly.
स्वेद	-	Will sweat profusely.
वेपथु	-	Shiver
त्रस्त	-	Loses strength
भीत	-	Fearful
स्खलति	-	Stumbles while walking and strammers on talking.
जृम्भ	-	Yawn frequently

अत्यर्थ शङ्कितः स्याद् बहुवाक् अथवा अल्पवाक् विगतलक्ष्मीः ।

प्राप्तः प्रकृति विकारं विषप्रदाता नरो ज्ञेयः ।। (च.सं.चि. २६/१०७)

The person administering the poison should be identified as

अत्यर्थ शङ्कित	-	Over conscious or utterly suspicious
बहुवाक्	-	Talking too much
अल्पवाक्	-	Talking less

- अलक्ष्मी - Devoid of luster
 प्रकृतिविकार - Change in normal behaviour of a person.

Acc. to सु.सं. (सु.क. 1/19-23)

न दद्यात् उत्तरं पृष्ठो विवक्षन् मोहमेति च।

The poisoner does not reply to a question and gets confused what to speak.

अपार्थं बहु सङ्कीर्णं भाषते चापि मूढवत्।

Speaks nonsense and behaves like foolish.

स्फोटयत्यङ्गुली भूमिमकस्माद्विलिखेद्धसेत्।।

स्फोटयत्यङ्गुली - Cracks fingers

भूमिम् अकस्मात् विलिखेत् - scratches earth suddenly

हसेत् - laughs

वेपथु - Shivers

व्रस्त - Looses strength and he will look here and there aimlessly.

क्षामो विवर्णवक्त्रश्च नखैः किञ्चिच्छिनत्यपि।।

क्षाम - Weak

विवर्ण वक्त्र - Pale face

नखैः किञ्चित् छिनत्ति - breaks the things with the help of nails.

आलभेतासकृद्दीनः करेण च शिरोरुहान्।

Acts as if he is innocent and repeatedly touches the hair of head.

निर्ययासुरपद्वारैर्वीक्षते च पुनः पुनः।।

Looks at back doors with an idea of running away.

विष पीत लक्षण

There are various references in the classics explaining the signs and symptoms exhibited by a person who has been administered with poison. *continuous pain*

✓ सवातं गृहधूमाभं पुरीषं योऽतिसार्यते। आध्मातो अत्यर्थमुष्णास्रो विवर्णः साद पीडितः।।

उद्वमत्यथ फेनं च विषपीतं तमादिशेत्। (सु.क. ४/३५-३६)

शरीर - वायुनी साधे

The person who has consumed poison eliminates stools accompanied with flatus, the faeces resembling the chimney soot (black in colour), liquid and expelled many times as in diarrhea. He exhibits great distension of abdomen, sheds warm tears, is discoloured and debilitated and complains of frothy secretions from the mouth.

फेनं वमति निःसंज्ञः श्यावपादकराननः। नासावसादो भङ्गोऽङ्गे विड्भेदः श्लथसन्धिता।।

विषपीतस्य दृष्टस्य दिग्धेनाभिहतस्य च।। (अ.ह.उ. ३६/३४-३५)

A person who complains of excessive frothy discharge from the mouth, becomes unconscious, complains of blackish discolouration of feet, palm and face, has pain in the nose and body parts, diarrhoea, laxity of the joints.

Signs and Symptoms of Visha Afflicted Organs and Personal Effects

[Poisoning with anjana, lepa, paduka, abharana etc]

Poisoning has been a common means of homicide since age old days. Be it poisoning of a king or a common man, different modes were used and these are described well in our samhitas.

The Usual Modes of Poisoning Include-

अन्नं पाने दन्तकाष्ठे तथाऽभ्यङ्गे अनुलेपने। उत्सादने कषाये च परिषेकं अनुलेपने।।

स्वक्षु वस्त्रेषु शय्यासु कवचाभरणेषु च। पादुका पादपीठेषु पृष्ठेषु गजवाजिनाम्।।

विषजुष्टेषु च अन्येषु नस्य धूम अञ्जनदिषु। (सु. क. १/२५-२७)

अन्न	:	Food materials
पान	:	Drinks
दन्तकाष्ठ	:	Tooth brush
अभ्यङ्ग	:	Materials of massage like oil
अवलेखन	:	Comb.
उत्सादन	:	Rubbing the body parts with powders
कषाय परिषेक	:	Medicated decoction which are used for bath.
अनुलेपन	:	Paste anointed to the body for improvement of complexion etc.
स्वक्षु	:	Garlands
वस्त्र	:	Cloth
शय्या	:	Bed
कवच	:	Shields worn on body for its protection.
आभरण	:	Ornaments
पादुका	:	Foot wear
पादपीठ	:	Foot rest
पृष्ठेषु गजवाजिनाम्	:	Vehicles used for riding like elephants and horses etc. (i.e. cloths used on their back before riding on them, if such clothes are poisoned).
नस्य	:	Snuff
धूम	:	Smoke
अञ्जन	:	Collyrium

The characteristic features and treatment of each of the above are explained in detail.

S.N. Mode of Poisonin

Symptom

Treatment

- | | | |
|----|-----------------------------------|--|
| 1. | अन्न ¹ | <p>सान्द्र : Viscous</p> <p>यात्यविस्त्राव्यतामिव : The rice is so moist that it appears as if it has not been filtered after cooking.</p> <p>चिरेण पच्यते : takes too much time to be cooked.</p> <p>पक्वो भवेत् पर्युषितोपमः decays easily.</p> <p>मयूर कण्ठ तुल्योष्मः Its vapour/flames will have flame resembling peacocks neck.</p> <p>मोह - मूर्च्छा - प्रसेक कृत् : causes confusion, fainting, excess salivation.</p> <p>हीयते वर्ण गन्धाद्यैः : loses its inherent colour and smell.</p> <p>क्लिद्यते चन्द्रिकाचितः : remains sticky even after proper straining and attains rainbow colour.</p> |
| 2. | द्रव द्रव्य ² | <p>भवन्ति विविधा राज्यः- Different kinds of lines may be seen on the surface of the liquid.</p> <p>फेन बुद्बुदजन्म च- Formation of froth and Bubbles छायाश्चात्र न दृश्यन्ते, यमल छद्र, विकृत छाय- Images will not be formed, even if formed will be double, broken, thin or distorted.</p> |
| 3. | शाक-सूप ³
अन्न मांस | <p>क्लिन्न - Very moist</p> <p>विरस - Tasteless</p> <p>सद्यः पर्युषितानीव विगन्धानि भवन्ति</p> |

१. ओदनो विषवान् सान्द्रो यात्यविस्त्राव्यतामिव । चिरेण पच्यते पक्वो भवेत्पर्युषितोपमः॥
मयूर कण्ठ तुल्योष्मा मोहमूर्च्छा प्रसेककृत् । हीयते वर्णगन्धाद्यैः क्लिद्यते चन्द्रिकाचितः॥ (अ.ह.सू. ७/३-४)
२. द्रव द्रव्येषु सर्वेषु क्षीर मद्य उदकादिषु भवन्ति विविधा राज्यः फेनबुद्बुदजन्म च ।
छायाश्चात्र न दृश्यन्ते दृश्यन्ते यदि वा पुनः । भवन्ति यमलाश्छद्रास्तन्व्यो वा विकृतास्तथा॥ (सु.क. १/४४)
३. शाक सूपान्न मांसानि क्लिन्नानि विरसानि च । सद्यः पर्युषितानीव विगन्धानि भवन्ति च॥
गन्ध वर्ण रसैर्हीनाः सर्वे भक्ष्याः फलानि च । पक्वान्याशु विशीर्यन्ते पाकमामानि यान्ति च॥ (सु.क. १/४६)

Treatment

S.N. Mode of Poisoning

Symptom

→ Devoid of smell as though soaked in water just now.

गन्ध वर्ण रसैर्हीना:-Devoid of odour, colour and taste.

पक्वानि आशु विशीर्यन्ते, पाक-मामानि यान्ति च
Raw ones undergo ripening quickly and even putrefy.

4. दन्तकाष्ठ¹
(Tooth stick/brush)
जिह्वा निलेख²
(Tongue scraper)
कवल
(Mouth gargles)

विशीर्यते कूर्चकस्तु- Poisoned tooth brush
looses its bristles.
श्वयथु in जिह्वा, दन्त, ओष्ठ
and मांस Swelling in tongue, teeth, lips
and gums

Paste³ of धातकी
पुष्प, हरीतकी, seed
of jambuphala,
added with honey.
Paste of root
of ankota or bark
of saptachada or
seeds of sirisha
mixed with honey.

5. अभ्यङ्ग विष⁴
(Poisoned anointing)
विषदुष्ट उत्सादन⁵
परिषेक, कषाय
[decoction used for
bath]

बहु पिच्छिलता Excess slimy
विवर्ण of different colour
स्फोट जन्म eruptions
रुज, स्त्राव pain, exudation,
त्वक् पाक- ulcer of the skin
स्वेदन- sweating
ज्वर: fever

शीताम्बु सिञ्चन⁶
Pouring cold water
on the body.
लेपन (applying
paste) of
चन्दन, तगर कुष्ठ,
उशीर, वेणु पत्रिका

१. विशीर्यते कूर्चकस्तु दन्तकाष्ठगते विषे । जिह्वादन्तौष्ठमांसानां श्वयथुश्चोपजायते॥ (सु.क. १/४८)

२. जिह्वानिलेख कवलौ दन्तकाष्ठवदादिशेत् ॥

३. अथास्य धातकी पुष्प पथ्या जम्बूफलास्थिभिः । सक्षौद्रैः प्रच्छितेशोफे कर्तव्यं प्रतिसारणम्॥

अथवाऽङ्गोटमूलानि त्वचः सप्तच्छदस्य वा । शिरीषमाषकावाऽपि सक्षौद्राः प्रतिसारणम्॥ (सु.क. १/४८-५०)

४. पिच्छिलो बहुलोऽभ्यङ्गो विवर्णो वा विषान्वितः । स्फोट जन्म रुजास्त्राव त्वक्पाकः स्वेदनं ज्वरः॥
दरणं चापि मांसानामभ्यङ्गे विषसंयुते। (सु.क. १/५२)

५. उत्सादने परिषेके कषाये चानुलेपने । शय्यावस्त्रेषु ज्ञेयमभ्यङ्ग लक्षणैः॥ (सु.क. १/५५)

६. तत्र शीताम्बुसिक्तस्थ कर्तव्यमनुलेपनम् । चन्दनं तगरं कुष्ठमुशीरं वेणुपत्रिका॥

सोमवल्ल्यमृता श्वेता पद्मं कालीयकं त्वचम् । कपित्थं रस मृत्राभ्यां पानमेतच्च युज्यते॥ (सु.क. १/५३-५४)

S.N. Mode of Poisoning

Symptom

Treatment

अनुलेपन, शय्या (Ointments, beddings) वस्त्र (dressings)	मांसावदरण- Tearing of muscle	सौमावल्लि, अमृत, श्वेत पद्म, कालीयक or त्वक् made with juice of कपित्थ and गोमूत्र. Drinking water should also be processed with these drugs and used.
6. विष जुष्ट अवलेखन ^१ - (Poisoned Comb) शिरोऽभ्यङ्ग (Massage on head) शिरस्त्राण (Helmet) स्नान (head bath) उष्णीय (Turban) स्त्रज ^३ (flowers on head)	केश शात, शिरोदुःख खेभ्य रुधिरागमन Shedding of hairs, headache, bleeding from minute channels ग्रन्थिजन्मोत्तमाङ्गेषु development of tumour (enlargement of lymph nodes) in the head	Application ^२ of paste of कृष्णमृत्तिका mixed with bile of ऋष्य, ghee, श्याम, प्रियङ्गु, त्रिवृत् ! and तण्डुलीयक or juice of fresh cow dungs or juice of मालन्ति beneficial or or मूषिक पर्णी is exposure to धूम of अगार संभव (kitchen black) क्षौद्र, घृतपान ^४ चन्दन प्रलेप along with घृत and also पयस्य मधुक फञ्जी, बन्धुजीव and पुनर्नवा along with घृत
7. विषजुष्ट मुखा- लेप ^५	मुख श्याव blackening of face युक्तमभ्यङ्गलक्षण Symptoms of अभ्यङ्गविष (Such as विवर्ण, स्फोटजन्म, रुजा, आस्राव, त्वक् पाक, मांसदरण) पद्मिनी कण्टकप्रख्यै कण्टक- स्वेदन, ज्वर, श्लोपचीयते Thorny eruptions on face like those are found in lotus flower.	

१. केशशातः शिरोदुःखं खेभ्यश्च रुधिरागमः । ग्रन्थि जन्मोत्तमाङ्गेषु विषजुष्टेऽवलेखने॥ (सु.क. १/५६)

२. प्रलेपो बहुशस्त्रप्र भाविताः कृष्णमृत्तिकाः । ऋष्यपित्त घृतश्यामा पालिन्दी तण्डुलीयकैः॥
गोमयस्वरसो वाऽपि हितो वा मालतीरसः । रसो मूषिकपर्ण्या वा धूमो वाऽगारसंभवः॥ (सु.क. १/५७-५८)

३. शिरोऽभ्यङ्ग शिरस्त्राणं स्नानमुष्णीषमेव च । स्त्रजश्च विषसंसृष्टाः साधयेदवलेखनात्॥ (सु.क. १/५९)

४. मुखालेपे मुखं श्यावं युक्तमभ्यङ्गलक्षणैः । पद्मिनीकण्टकप्रख्यैः कण्टकैश्चोपयीयते॥ (सु.क. १/६०)

५. तत्र क्षौद्रघृतं पानं प्रलेपश्चन्दनं घृतम् । पयस्या मधुकं फञ्जी बन्धुजीवः पुनर्नवा॥ (सु.क. १/६१)

S.N. Mode of Poisoning

Symptom

8. वाहन¹ (on riding animals or vehicles)

अस्वास्थ्यं कुञ्जरादीनां Animals like elephants etc will become ill. लालास्राव, अक्षिरक्तता More salivation and redness of the eyes are seen. स्फिक् पायु मेढ्र मुष्केषु स्फोटसम्भव rider will develop eruptions on his buttocks, anus, penis and scrotum.

9. नस्य, धूमविष²
(Snuff and smoke)

शोणितागमन खेभ्य-bleeding from orifices शिरोरुक् कफ संस्रव-headache, disorders of कफ इन्द्रियाणां च वैकृत्यं-disorders of sense organs

10. पुष्प माला³
(Garland)

गन्धहानि विवर्णत्व-flowers found devoid of odour, change in colour म्लानता-dull with red flowers शिरोदुःख, वारिपूर्णलोचन-The person inhaling of their smell will develop headache and eyes full of tears

Treatment

Similar to that अभ्यङ्ग चिकित्सा² like शीताम्बु सिञ्चन, लेपन of चन्दन, तगर, कुष्ठ, उशीर, वेणु पत्रिका, सोमवल्लि, अमृता, श्वेता पद्म कालीयक त्वक् made with juice of कपित्थ and गोमूत्र. Drinking water also should be processed with these drugs and used.

गवादीनां दुग्ध सर्पि सातिविष Milk of cow and ghee along with अतिविष (administration) श्वेत, मदयन्तिक used for drinking and as nasal drops⁵

Similar to that of⁴ नस्य, धूम, and- मुखालेप विषगोदुग्ध, गोघृत along with अतिविष श्वेत, मदयन्तिक-are administered orally

१. अस्वास्थ्यं कुञ्जरादीनां लालास्रावोऽक्षिरक्तता। स्फिक् पायु मेढ्रमुष्केषु यातुश्च स्फोटसंभवः॥ (सु.क. १/६२)
२. तत्राभ्यङ्गवदेवेष्टा यातुवाहनयोः क्रिया॥ (सु.क. १/६२)
३. शोणितागमनं खेभ्यः शिरोरुक्कफसंस्रवः। नस्यधूमगते लिङ्गमिन्द्रियाणां च वैकृतम्॥ (सु.क. १/६३)
४. तत्र दुग्धैर्वादीनां सर्पिः सातिविषैः शृतम्। पाने नस्ये च सश्चेतं हितं समदयन्तिकम्॥ (सु.क. १/६४)
५. गन्धहानिर्विवर्णत्वं पुष्पाणां म्लानता भवेत्। जिघ्रतश्च शिरोदुःखं वारिपूर्णं च लोचने॥ (सु.क. १/६५)
६. तत्र बाष्पेरितं कर्म मुखालेपे च यत् स्मृतम्॥ (सु.क. १/६६)

S.N. Mode of Poisoning Symptom

11. कर्ण and तैल विष^१ - (Poisoned oil for ears)

श्रोत्र वैगुण्यं शोफ वेदने-disorders of hearing, swelling, pain कर्ण स्राव-exudation of the ears.

Treatment

आशु प्रतिपूरण with^२ fresh juice of बहुपत्र (मयूर शिख) added with घृत and क्षौद्र or सुशीत सोमवल्लिक is beneficial

12. पादुका, पादपीठ^३ (foot rest and pillows)

शोफ, स्राव, स्वाप, पादयो स्फोट जन्म
The wearer will have swelling, exudation loss of sensation eruptions in the feet without any doubt.

Treatment for this are according to the developed symptoms ex: for शोफ particular treatment of शोफ is given.

13. अञ्जन विष^४ (collyrium)

अश्रूपदेह, दाह, वेदना accumulation of waste in eyes, burning sensation, pain दृष्टि विभ्रम आन्ध्य-disorders of

सद्य घृत पान^५ तर्पणं च समागधं groats added with मागध (पिप्पली) निर्योस of vision and blindness मेषशृंगी and वरुण should be applied to the eyes as अञ्जन or we can use मुष्कक. अजकर्ण and समुद्रफेन mixed with गोपित्त, कपित्थ, मेषशृंगी and collyrium of flowers of भल्लातक, बन्धूव and उत्कट each separately may be

१. कर्णतैलगते श्रोत्रवैगुण्यं शोफवेदने । कर्णस्रावश्च..... ॥ (सु.क. १/६७)

२.तत्राशु कर्तव्यं प्रतिपूरणम् । स्वरसो बहुपत्रायाः सघृतः क्षौद्रसंयुतः । सोमावल्करसश्चापि सुशीतो हित इष्यते ॥ (सु.क. १/६८)

३. शोफः स्रावस्तथा स्वापः पादयोः स्फोटजन्म च । भवन्ति विषजुष्टाभ्यां पादुकाभ्यामसंशयम् ॥ उपानत्पादपीठानि पादुकावत् प्रसाधयेत् ॥ (सु.क. १/७२-७३)

४. अश्रूपदेहो दाहश्च वेदना दृष्टिविभ्रमः । अञ्जने विषसंसृष्टे भवेदान्ध्यमथापि च ॥

५. तत्र सद्यो घृतं पेयं तर्पणं च समागधम् । अञ्जनं मेषशृङ्गस्य निर्योसो वरुणस्थ च ॥ मुष्ककस्याजकर्णस्य फेनो गोपित्तं संयुतः । कपित्थं मेषशृङ्गयोश्च पुष्पं भल्लातकस्य वा । एकैकं कारयेत् पुष्पं बन्धूकाङ्कोटयोरपि ॥ (सु.क. ६९-७१)

S.N. Mode of Poisoning Symptom

Treatment

14. आभरण विष^१
Ornaments

भूषणानि हतर्चीषि They lose their
brightness न विभान्ति यथापुरा They do
not shine as before.
स्वानि स्थानानि हन्ति damage their
places by causing दाह, पाकावदारण^२
burning sensation and suppuration

used as प्रत्यङ्गन (counter
collyrium)
अभ्यङ्ग विधि^३ of the place.
Treatment according
to the symptoms deve
loped as in पादुका विष
should be administered^३

Important Questions:

Short Answers:

1. Tests for detection of visha.
2. Panchabhautika Pareeksha for Visha.
3. Visha data lakshana.
4. Vishakta Anjana Lakshana.
5. Vishakta mukhaalepa lakshana.
6. Paduka Visha.

१. भूषणानि हतर्चीषि न विभान्ति यथा पुरा । स्वानि स्थानानि हन्युश्च दाहपाकावदारणैः॥ (सु.क. १/७४)
२. पादुकाभूषणेषूक्तमभ्यङ्ग विधिमारचरेत्॥ (सु.क. १/७४)

Environmental Toxicity

Environmental Toxicology:

The Study of poisons/pollutants and their action on the environment constitute environmental toxicity.

The Natural Environment:

Man's environment is called the biosphere which consists of the earth's crust, the surrounding atmosphere and the various forms of life that exist in it. The biosphere is very complex and so is usually divided into smaller units or ecosystems.

Ecosystem- A system formed by the interaction of community of organisms with their environment.

It is generally accepted that a significant environmental impact occurs when the structure or function of the ecosystem is permanently displaced from the normal. This displacement may be permanent or of a short term nature and may be followed by a complete recovery.

Concept of Pollution:

According to Odum (1971), "Pollution is an undesirable change in physical, chemical and biological characteristics of air, water and soil that may harmfully affect the life or create a potential health hazard for living organisms".

According to Edward (1972) "Pollution is the release of harmful substances or energy into the environment by man in quantities that damage health and resources". According to tiasmann (1975) "Pollution is the accumulation of substances in the environment or at rates of flow which exceed the capacity of the eco-system to either neutralise or disperse them to harmful levels".

According to national Environmental Research Council (1976), "Pollution is viewed as the release of substances and energy as waste products of human activities which result in harmful changes within the natural environment".

According to Kudesia, "Pollution is defined as the addition of extraneous materials (inorganic, organic, biological or radiological) to water, air or land which adversely affects the natural quality of environment.

Pollution is thus, direct or indirect change in any component of the environment which is harmful to the living organisms and in particular undesirable for man.

Sometimes, instead of pollution another term "**Contami-nation**" is used by some scientists. Contamination means the presence of harmful substances or organisms in air, water or soil which may cause diseases or discomfort to the human being. However, the polluted materials need not necessarily be contami-nated.

Pollutant:

According to the Indian Environment (Protection) Act, 1986, "A pollutant has been defined as any solid, liquid or gaseous substance present in such concentration which tends to be injurious to the environment". It may include all substances or effect which adversely alters the environment by changing the growth rate of species, interferes with health, comfort, amenities or property values of the people.

Classification of Pollutants:

1. **Naturally occurring pollutants:** includes poisonous plants, venomous reptiles, insects and toxic minerals.
2. **Man made pollutants:** These are related to the production and use of energy, the production and use of industrial chemicals, and increased agricultural activity.

In terms of eco-system, the pollutants can be classified into two basic groups:

(a) Non-degradable Pollutants:

These are not broken down by the natural processes like action of microbes. Most of these mutants get accumulated in the environment and also get biologically magnified as these move along the food chains. These may also react with other compounds in the environment to produce toxins.

These can be further subdivided into two more classes:

(I) Waste:

E.g. Glass, plastic, phenolic, aluminum cans etc.

(ii) Poisons:

e.g: Radio-active substances, pesticides, smog gases, heavy metals like mercury, lead and their salts.

(b) Degradable Pollutants or Bio-degradable Pollutants (Odum 1971):

These are natural organic substances which can be decomposed, removed or consumed and thus, reduced to acceptable levels either by natural processes like biological or microbial action or by some engineered systems, like sewage treatment plants.

The degradable pollutants can be further sub-divided into two categories:

(i) Rapidly Degradable or Non-persistent Pollutant:

The degradation of these pollutants is very faster process. For example, the decomposition of sewage and wastes of animals and plants is a faster process. The domestic sewage can be rapidly decomposed by natural processes. However, the problems become complicated when the input into environment get exceeded of the decomposition or dispersal capacity.

(ii) Slowly Degradable or Persistent Pollutant:

The degradation of these pollutants is a very slower process. It seems as if the amount of pollutant remains unchanged with time. For example, degradation of synthetic compounds and radio-active elements like Iodine 137, Strontium 90 or Plutonium 239 takes a longer period of time.

Air Pollution:

The Ayurvedic Classics have explained the concept of Pollution under दूषित वायु, जल and भूमि. The enemies of a ruler may poison the pastures, water, roads, food stuffs and smoke of their country and even charge the atmosphere with poison in the event of his making incursions into their country. The poisonous nature of the foregoing things should be ascertained from the following features and should be duly purified.

१. दूषित वायु लक्षणः -

धूमेऽनिले वा विषसंप्रयुक्ते खगाः श्रमार्ताः प्रपतन्ति भूमौ।

कास प्रतिश्याय शिरोरूजश्च भवन्ति तीव्रा नयनामयाश्च ॥ (सु. क. ३/१६)

The dropping of birds from the sky to the earth below in a tired condition is a distinct indication of the wind and the smoke being charged with poison.

It is further attended with an attack of cough, catarrh, headache and of severe eye disease in those who inhale the smoke.

Treatment:

Atmosphere should be purified by burning quantities of laksha, haridra, ativisha, abhaya, abda, renuka, ela, dala, vakra, kushta and priyangu in the open ground. The fumes of these drugs would purify the anila and the dhuma from the poison.

लाक्षा हरिद्र अतिविष अभया अब्द हरेणुक ऐलादल वक्र कुष्ठम् ।

प्रियङ्गुकां चाप्यनिले निधाय धूमानिलौ चापि विशोधयेत् ॥ (सु. क. ३/१७)

Air Pollution:

An air pollutant is a material in the air that can have adverse effects on humans and the ecosystem. The substance can be solid particles, liquid droplets, or gases. Air pollution occurs when harmful or excessive quantities of substances including gases, particulates, and

biological molecules are introduced into Earth's atmosphere. It may cause diseases, allergies and also death of humans; it may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Human activity and natural processes can both generate air pollution.

Substances emitted into the atmosphere by human activity include:

- **Carbon dioxide** is a natural component of the atmosphere, essential for plant life and given off by the human respiratory system. CO_2 currently forms about 410 parts per million (ppm) of earth's atmosphere, compared to about 280 ppm in pre-industrial times, and billions of metric tons of CO_2 are emitted annually by burning of fossil fuels.
- **Sulphur dioxide** is produced by volcanoes and in various industrial processes. Coal and petroleum often contain sulphur compounds, and their combustion generates sulphur dioxide. Further oxidation of SO_2 , usually in the presence of a catalyst such as NO_2 , forms H_2SO_4 , and thus causes acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources.
- **Nitrogen dioxide**, are expelled from high temperature combustion, and are also produced during thunderstorms by electric discharge. They can be seen as a brown haze dome above or a plume downwind of cities.
- **Carbon monoxide** is a colourless, odourless, toxic yet non-irritating gas. It is a product of combustion of fuel such as natural gas, coal or wood. Vehicular exhaust contributes to the majority of carbon monoxide let into our atmosphere. It creates a smog type formation in the air that has been linked to many lung diseases and disruptions to the natural environment and animals.
- Increased levels of fine particles in the air are linked to health hazards such as heart disease, altered lung function and lung cancer. Particulates are related to respiratory infections and can be particularly harmful to those already suffering from conditions like asthma.
- **Chlorofluorocarbons (CFCs)** are harmful to the ozone layer. These are gases which are released from air conditioners, refrigerators, aerosol sprays, etc. On release into the air, CFCs rise to the stratosphere. Here they come in contact with other gases and damage the ozone layer. This allows harmful ultraviolet rays to reach the earth's surface. This can lead to skin cancer, eye disease and can even cause damage to plants.
- **Ammonia (NH_3)** is emitted mainly from agricultural processes. Although in wide use, ammonia is both caustic and hazardous. In the atmosphere, ammonia reacts with oxides of nitrogen and sulphur to form secondary particles.
- **Odours**-such as from garbage, sewage, and industrial processes

- **Radioactive pollutants**-produced by nuclear explosions, nuclear events, war explosives, and natural processes such as the radioactive decay of radon.
- **Minor air pollutants** include the persistent organic pollutants (POPs) which are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes. Because of this, they have been observed to persist in the environment, to be capable of long-range transport, bio accumulate in human and animal tissue, bio magnify in food chains, and to have potentially significant impacts on human health and the environment.

Health Effects:

Air pollution is a significant risk factor for a number of pollution-related diseases, including respiratory infections, heart disease, COPD, stroke and lung cancer. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma and worsening of existing respiratory and cardiac conditions. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, and the individual's health status and genetics.

Mortality:

The World Health Organization estimated in 2014 that every year air pollution causes the premature death of some 7 million people worldwide. India has the highest death rate due to air pollution. India also has more deaths from asthma than any other nation according to the World Health Organization.

Cardiovascular Disease:

A 2007 review of evidence found ambient air pollution exposure is a risk factor correlating with increased total mortality from cardiovascular events (range: 12% to 14% per 10 microg/m³ increase). Air pollution is also emerging as a risk factor for stroke, particularly in developing countries where pollutant levels are highest.

Lung Disease:

Research has demonstrated increased risk of developing asthma and COPD from increased exposure to traffic-related air pollution. Additionally, air pollution has been associated with increased hospitalization and mortality from asthma and COPD. More recent studies have shown that air pollution exposure from traffic reduces lung function development in children. Air pollution exposure also cause lung cancer in non smokers.

Cancer:

Cancer is mainly the result of environmental factors. In 2011, a large Danish epidemiological study found an increased risk of lung cancer for patients who lived in areas with high nitrogen oxide concentrations. Researches also state evidence of possible

associations between air pollution and other forms of cancer, including cervical cancer and brain cancer.

Medical scientists opine that cancer is overwhelmingly a result of environmental factors. Maintaining a healthy weight, eating a healthy diet, minimizing alcohol and eliminating smoking reduce the risk of developing the disease.

Infants:

Ambient levels of air pollution have been associated with preterm birth and low birth weight. A 2014 WHO worldwide survey on maternal and perinatal health found a statistically significant association between low birth weights (LBW) and increased levels of exposure to PM2.5.

Central Nervous System:

Research shows that air pollution affects short-term memory, learning ability, and impulsivity and may play a role in autism, as well as in other neurodevelopment disorders.

Measures for Reduction of Air Pollution:

- Because a large share of air pollution is caused by combustion of fossil fuels such as coal and oil, the reduction of these fuels can reduce air pollution drastically. Most effective is the switch to clean power sources such as wind power, solar power, hydro power which don't cause air pollution.
- Electric power generation from burning fossil fuels can be replaced by power generation from nuclear and renewables. Heating and home stoves that contribute much to regional air pollution can be replaced by a much cleaner fossil fuel like natural gas, or ideally, renewables.
- Motor vehicles driven by fossil fuels, a key factor in urban air pollution, can be replaced by electric vehicles. Herding more people into clean public transit such as electric trains can also help.
- Reducing travel in vehicles can curb pollution.
- Biodigesters can be utilized in poor nations where slash and burn is prevalent, turning a useless commodity into a source of income. The plants can be gathered and sold to a central authority that will break it down in a large modern biodigester, producing much needed energy to use.

Water Pollution:

२. दूषित जल लक्षणः -

दुष्टं जलं पिच्छिलम् उग्रगन्धि फेनान्वितं राजिभिरावृतं च।

मण्डूक मत्स्यं म्रियते विहङ्गामत्ताश्च सानूपचरा भ्रमन्ति ।।

मज्जन्ति ये चात्र नर अश्व नागास्ते च्छर्दि मोह ज्वर दाह शोफान् ।

गच्छन्ति तेषामवहृत्य दोषान् दुष्टं जलं शोधयितुं यतेत् ॥ (सु.क. ३/७-८)

- The poisoned water becomes slimy, strong smelling, frothy and marked with black coloured lines on the surface.
- Frogs and fish living in the water die without any apparent cause.
- Birds and beasts that live in the water and its shores roam about wildly in confusion
- Men, horses or elephants by bathing in this water are afflicted with vomiting, fainting, fever, burning sensation and swelling in the limbs.

Treatment:

Dhava Ashwakarnadi Yoga:

The cold ashes of the drugs- dhava, ashwakarna, asana, paribhadra, patala, siddhaka, mokshaka, rajadruma and somavalka are burnt together and should be cast into the poisoned pool or tank where by its water would be purified. An anjali measure of the said ash cast in a ghata measure of water would purify it.

धवा अश्वकर्ण असन परिभद्रान् सपाटलान् सिद्धक मोक्षकौ च ।

दग्ध्वा सराजद्रुम सोमवल्कां स्तब्धस्म शीतं वितरेत् सरःसु ॥

भस्माञ्जलि चापि घटे निधाय विशोधयदीप्तमेवमम्भः ॥ (सु.क. ३/९-१०)

Water Pollution:

Water pollution is the contamination of water bodies, usually as a result of human activities. Water bodies include for example lakes, rivers, oceans and groundwater. Water pollution results when contaminants are introduced into the natural environment. Releasing inadequately treated wastewater into natural water bodies can lead to degradation of aquatic ecosystems. In turn, this can lead to public health problems for people living downstream. They may use the same polluted river water for drinking or bathing or irrigation. Water pollution is the leading worldwide cause of death and disease.

Sources:

- **Natural** - Eutrophication by leaching of minerals, putrefaction in small ponds due to leaves silting in lakes and rivers. Leaching of toxic ions e.g. Copper and Iron.
- **Man-made** - Domestic sewage
- Industrial effluents, heavy metal pollutants from industrial processes
- Eutrophication e.g. nitrates from fertilizers, phosphates from detergents etc.
- Thermal e.g. cooling water from power stations.
- Radioactive wastes and oil washings from oil tankers, accidents at sea.

Floating plastic debris can be a strong source of toxic chemicals for ocean pollution, potentially poisoning any creature that eats it. Many of these long-lasting pieces end up in the stomachs of marine birds and animals. This results in obstruction of digestive pathways, which leads to reduced appetite or even starvation.

- There are a variety of secondary effects stemming not from the original pollutant, but a derivative condition. An example is silt-bearing surface runoff, which can inhibit the penetration of sunlight through the water column, hampering photosynthesis in aquatic plants.

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical changes such as elevated temperature and discoloration. While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese, etc.) the concentration usually determines what is a natural component of water and what is a contaminant. High concentrations of naturally occurring substances can have negative impacts on aquatic flora and fauna.

Oxygen-depleting substances may be natural materials such as plant matter (e.g. leaves and grass) as well as man-made chemicals.

Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and eutrophication. Eutrophication is an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases the primary productivity of the ecosystem. Depending on the degree of eutrophication, subsequent negative environmental effects such as anoxia (oxygen depletion) and severe reductions in water quality may occur, affecting fish and other animal populations.

Disease-causing microorganisms are referred to as pathogens. Pathogens can produce waterborne diseases in either human or animal hosts. *Burkholderia pseudomallei*, *Cryptosporidium parvum*, *Giardia lamblia*, *Salmonella*, *Norovirus*, Parasitic worms including the *Schistosoma* type are some examples. High levels of pathogens may result from on-site sanitation systems (septic tanks, pit latrines) or inadequately treated sewage discharges. Older cities with ageing infrastructure may have leaky sewage collection systems (pipes, pumps, valves), which can cause sanitary sewer overflows. Some cities also have combined sewers, which may discharge untreated sewage during rain storms. Silt (sediment) from sewage discharges also pollutes water bodies.

Organic water pollutants include detergents, disinfection by-products found in chemically disinfected drinking water, such as chloroform, food processing waste, which can include oxygen-demanding substances, fats and grease, insecticides and herbicides, a huge range of organohalides and other chemical compounds, petroleum hydrocarbons,

including fuels (gasoline, diesel fuel, jet fuels, and fuel oil) and lubricants (motor oil).

Inorganic Water Pollutants Include:

- Acidity caused by industrial discharges (especially sulfur dioxide from power plants)
- Ammonia from food processing waste
- Chemical waste as industrial by-products
- Fertilizers containing nutrients--nitrates and phosphates--which are found in storm water runoff from agriculture, as well as commercial and residential use
- Heavy metals from motor vehicles (via urban storm water runoff) and acid mine drainage
- Silt (sediment) in runoff from construction sites, logging, slash and burn practices or land clearing sites.

Macroscopic pollution--large visible items polluting the water--may be termed "floatables" in an urban storm water context, or marine debris when found on the open seas, and can include such items as trash or garbage (e.g. paper, plastic, or food waste) discarded by people on the ground, along with accidental or intentional dumping of rubbish, that are washed by rainfall into storm drains and eventually discharged into surface water.

Thermal pollution is the rise or fall in the temperature of a natural body of water caused by human influence. Thermal pollution, unlike chemical pollution, results in a change in the physical properties of water. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. Elevated water temperatures decrease oxygen levels, which can kill fish and alter food chain composition, reduce species biodiversity, and foster invasion by new thermophilic species.

Effects of Water Pollution:

On Human Health:

Contaminated water can spread several diseases. Low-income communities are disproportionately at risk because their homes are often closest to the most polluting industries. Waterborne pathogens, in the form of disease-causing bacteria and viruses from human and animal waste, are a major cause of illness from contaminated drinking water. Diseases spread by unsafe water include cholera, giardia, and typhoid. Accidental or illegal releases from sewage treatment facilities, as well as runoff from farms and urban areas, contribute harmful pathogens to waterways. A wide range of chemical pollutants--from heavy metals such as arsenic and mercury to pesticides and nitrate fertilizers--are getting into our water supplies. Once they're ingested, these toxins can cause a host of health issues, from cancer to hormone disruption to altered brain function. Children and pregnant women are particularly at risk. Even swimming can contract health issues such as skin rashes, pink eye,

respiratory infections etc.

On the Environment:

The proliferation of newly introduced nutrients from water pollution stimulates plant and algae growth, which in turn reduces oxygen levels in the water. This dearth of oxygen, known as eutrophication, suffocates plants and animals and can create "dead zones," where waters are essentially devoid of life. In certain cases, these harmful algal blooms can also produce neurotoxins that affect wildlife, from whales to sea turtles. Chemicals and heavy metals from industrial and municipal wastewater contaminate waterways as well. These contaminants are toxic to aquatic life-most often reducing an organism's life span and ability to reproduce-and make their way up the food chain as predator eats prey. Marine ecosystems are also threatened by marine debris, which can strangle, suffocate, and starve animals. Meanwhile, ocean acidification is making it tougher for shellfish and coral to survive. Though they absorb about a quarter of the carbon pollution created each year by burning fossil fuels, oceans are becoming more acidic. This process makes it harder for shellfish and other species to build shells and may impact the nervous systems of sharks, clownfish, and other marine life.

Control of Pollution:

Municipal Wastewater Treatment:

In urban areas of developed countries, municipal wastewater (or sewage) is typically treated by centralized sewage treatment plants. Well-designed and operated systems can remove 90 percent or more of the pollutant load in sewage. Some plants have additional systems to remove nutrients and pathogens, but these more advanced treatment steps get progressively more expensive.

Nature-based solutions are also being used instead of centralized treatment plants.

Some industrial facilities generate wastewater that is similar to domestic sewage and can be treated by sewage treatment plants. Industries that generate wastewater with high concentrations of organic matter (e.g. oil and grease), toxic pollutants (e.g. heavy metals, volatile organic compounds) or nutrients such as ammonia, need specialized treatment systems. Some industries install a pre-treatment system to remove the pollutants, and then discharge the partially treated wastewater to the municipal sewer system. Industries generating large volumes of wastewater typically operate their own treatment systems. Some industries have been successful at redesigning their manufacturing processes to reduce or eliminate pollutants, through a process called pollution prevention.

Nutrients (nitrogen and phosphorus) are typically applied to farmland as commercial fertilizer, animal manure, or spraying of municipal or industrial wastewater (effluent) or

sludge. Nutrients may also enter runoff from crop residues, irrigation water, wildlife, and atmospheric deposition.

To minimize pesticide impacts, farmers may use Integrated Pest Management (IPM) techniques (which can include biological pest control) to maintain control over pests, reduce reliance on chemical pesticides, and protect water quality.

Land Pollution:

३. दूषित देश लक्षणः -

क्षिति प्रदेशं विषदूषितं तु शिलातलं तीर्थमथेरिणं वा ।

स्मृशन्ति गात्रेण तु येन-येन गो वाजि नाग उष्ट्र खरा नरा वा ॥

तच्छूनतां यात्यथ दह्यते च विशीर्यते रोम नखं तथैव ॥ (सु.क. ३/१०-११)

- A poisoned ground or stone slab, desert or county side would give rise to swelling in those parts of the bodies of men, bullocks, horses, asses, camels and elephants that may chance to come in contact with them.
- In such cases, a burning sensation is felt in the affected part and hair and nails of these parts fall off.

Treatment:

In these cases, the poisoned surface should be purified by sprinkling it over with a solution of ananta and sarvagandha dissolved in wine or with black clay dissolved with water or with decoction of vidanga, patha and katabhi.

तत्रापि अनन्तां सह सर्वगन्धैः पिष्ट्वा सुराभिर्विनियोज्य मार्गम् ।

सिञ्चेत् पयोभिः सुमृदन्वितैस्तं विडङ्ग पाठा कटभी जलैर्वा ॥ (सु.क. ३/१२)

Land Pollution :

Land pollution means degradation or destruction of earth's surface and soil, directly or indirectly as a result of human activities. Before the 20th century, most of the materials people used were completely natural, produced from either plants, animals, or minerals found in the earth so, when they were disposed of, the waste products they generated were natural and harmless too, mostly organic and carbon-based materials that would simply biodegrade. But during the 20th century, the development of plastics and other synthetic (human-created) materials has produced a new generation of unnatural materials that the natural environment has no idea how to break down. Nuclear plants produce toxic waste that can remain dangerously radioactive for thousands of years and will contaminate anything or anyone that comes into contact with it.

Causes of Land Pollution:

- 1. Deforestation and soil erosion:** Deforestation carried out to create dry lands is one of the major concerns. Land that is once converted into a dry or barren land, can never be made fertile again, whatever the magnitude of measures to redeem it are. Land conversion, meaning the alteration or modification of the original properties of the land to make it use-worthy for a specific purpose is another major cause. This hampers the land immensely. Also there is a constant waste of land. Unused available land over the years turns barren; this land then cannot be used. So in search of more land, potent land is hunted and its indigenous state is compromised with.
- 2. Agricultural activities:** With growing human population, demand for food has increased considerably. Farmers often use highly toxic fertilizers and pesticides to get rid of insects, fungi and bacteria from their crops. However with the overuse of these chemicals, they result in contamination and poisoning of soil.
- 3. Mining activities:** During extraction and mining activities, several land spaces are created beneath the surface. Surface mining requires the removal of topsoil - the fertile layer of soil and organic matter that is particularly valuable for agriculture, to get at the valuable rocks below. Even if the destruction of topsoil is the worst that happens, it can turn a productive landscape into a barren one, which is a kind of pollution.
- 4. Overcrowded landfills:** Each household produces tonnes of garbage each year. Garbage like aluminium, plastic, paper, cloth, wood is collected and sent to the local recycling unit. Items that cannot be recycled become a part of the landfills that hampers the beauty of the city and cause land pollution.
- 5. Industrialization:** Due to increase in demand for food, shelter and house, more goods are produced. This results in creation of more waste that needs to be disposed of. To meet the demand of the growing population, more industries were developed which led to deforestation, development of newer fertilizers and chemicals that are highly toxic and lead to soil contamination.
- 6. Construction activities:** Due to urbanization, large amount of construction activities are taking place which has resulted in large waste articles like wood, metal, bricks, plastic that can be seen by naked eyes outside any building or office which is under construction.
- 7. Nuclear waste:** Nuclear plants can produce huge amount of energy through nuclear fission and fusion. The left over radioactive material contains harmful and toxic chemicals that can affect human health. They are dumped beneath the earth to avoid any casualty.

8. **Sewage treatment:** Large amount of solid waste is leftover once the sewage has been treated. The leftover material is sent to landfill site which end up in polluting the environment.

Effects of Land Pollution:

1. **Soil pollution:** Soil pollution is another form of land pollution, where the upper layer of the soil is damaged. This is caused by the overuse of chemical fertilizers, soil erosion caused by running water and other pest control measures; this leads to loss of fertile land for agriculture, forest cover, fodder patches for grazing etc.
2. **Effect on human health:** The land gets contaminated with toxic chemicals and pesticides. These toxic chemicals can reach our body through foods and vegetables that we eat as they are grown in polluted soil.
3. **Cause Air pollution:** Landfills across the city keep on growing due to increase in waste and are later burned which leads to air pollution. They become home for rodents, mice etc which in turn transmit diseases.
4. **Distraction for Tourist:** The city loses its attraction as tourist destination as landfills do not look good when you move around the city. It leads to loss of revenue for the state government.
5. **Effect on wildlife:** The animal kingdom has suffered mostly in the past decades. They face a serious threat with regards to loss of habitat and natural environment. The constant human activity on land is leaving it polluted; forcing these species to move further away and adapt to new regions or die trying to adjust. Several species are pushed to the verge of extinction, due to no homeland.

Other issues that we face include increased temperature, unseasonal weather activity, acid rains etc. The discharge of chemicals on land, makes it dangerous for the ecosystem too. These chemicals are consumed by the animals and plants and thereby make their way in the ecosystem. This process is called bio magnification and is a serious threat to the ecology.

Solutions for Land Pollution:

1. Make people aware about the concept of Reduce, Recycle and Reuse.
2. Reduce the use of pesticides and fertilizers in agricultural activities.
3. Avoid buying packages items as they will lead to garbage and end up in landfill site.
4. Ensure that you do not litter on the ground and do proper disposal of garbage.
5. Buy biodegradable products.
6. Do Organic gardening and eat organic food that will be grown without the use of pesticides.

7. Create dumping ground away from residential areas.

सामरिक विष प्रयोग

Effect of Chemical and Nuclear Warfare

War gases:

These are chemicals – solid, liquid or gas, which are used for producing destruction or damage, mostly at times of war.

Chemical warfare involves using the toxic properties of chemical substances as weapons.

Types of Chemical Warfare Agents (CWA):

The major categories of Chemical Warfare Agents include:

1. Asphyxiants or Lung irritants.
2. Vesicants or blister gases
3. Lacrimators or tear gases
4. Sternutators or Nasal irritants
5. Nerve gases
6. Paralysants
7. Miscellaneous.

1. Asphyxiants or Lung Irritants:

- These are chlorine and phosgene gas and can be released from tanks and gas shells.
- Phosgene is ten times more toxic than chlorine.
- Their action is mainly on pulmonary alveoli.

Symptoms:

- Watering of the eyes.
- Coughing
- Dyspnea
- Tightness of the chest.
- Headache
- Vomiting
- Restlessness
- Stertorous breathing
- Cyanosis and collapse
- Death occurs in 24-48 hrs due to acute pulmonary oedema or bronchopneumonia.

Treatment:

- Remove the patient into fresh air.
- Wash the eyes with normal saline and boric acid.
- Oxygen and adrenaline when needed.
- Antitussives for cough and antibiotics for infection.

2. Vesicants or Blister Gases:

- Mainly mustard gas (Dichlorodiethyl sulphide or yperite) and lewisite (dichlorarsine)
- These are volatile liquids and discharged in artillery shells so as to saturate the area of attack.

Symptoms:

- Mustard gas causes irritation of the eyes, nose and throat and respiratory passages, nausea, vomiting, and abdominal pain.
- It penetrates the clothes and produces intense itching, redness, blisters and ulceration, especially of the moist areas of the skin.
- Lewisite causes blisters on the skin and inflammation of mucous membrane and on absorption produces signs of arsenic poisoning.

Treatment:

- Wash the affected parts thoroughly with soap and water.
- Wash the eyes with sodium bicarbonate solution.
- Use BAL as an antidote to lewisite.

3. Lacrimators or Tear Gases:

- Mainly chloracetophenone (CAP) which is solid and ethyliodoacetate (KSK) and bromobenzylcyanide (BBC) which are liquids.
- They are fired in artillery shells or pen guns.

Symptoms:

- Intense irritation of the eyes.
- Lacrimation
- Spasm of the eyelids, temporary blindness with irritation of air passages.
- With long continued exposure, there may be nausea, vomiting and blistering of the skin.

Treatment:

- Remove the patient to fresh air.
- Wash the eyes with warm normal saline or boric acid solution.!

- Weak sodium bicarbonate solution on skin.

4. Sternutators or Nasal Irritants:

- They include- diphenyl chlorarsine (DA), diphenylamine chorarsine (DM) and diphenyl cyanarsine (CD).
- These are solid organic compounds of arsenic and are fired in artillery shells to control riots.

Symptoms:

- Intense pain and irritation in the nose and sinuses
- Sneezing
- Headache
- Malaise
- Salivation
- Nausea
- Vomiting,
- Tightness in the chest.

Treatment:

- Remove the patient to fresh air.
- Nose irrigated with 5% sodium bicarbonate.

5. Nerve Gases:

- Though these are termed as nerve gases, they are colourless and odourless, volatile liquids at room temperature are esters of phosphoric acid, identical to Organo-phosphorous compounds.
- They are divided into 2 classes: **G and V agents**.
- **G** agents include- **GA** (Tabun), **GB** (Sarin), **GD** (Soman) and **GF** (Cyclosarin)
- **V** agents include- **VE, VM, VG, VR, and VX**.

Mechanism of Action:

- Irreversible inactivation of acetylcholine esterase at the cholinergic synapses leading to accumulation of toxic levels of acetylcholine at the synaptic junctions.

Symptoms:

- Headache
- Sweating,
- Nausea
- Vomiting!

- Miosis
- Ocular pain
- Impaired visual acuity
- Lacrimation
- Bloodshot eyes
- Rhinorrhea
- Wheezing
- Respiratory failure
- Bradycardia
- Atrioventricular block
- Fatigue
- Muscle weakness

Treatment:

- Similar to organophosphates.

6. Paralytants:

- These include use of hydrocyanic acid, hydrogen sulphide and carbon monoxide.

7. Miscellaneous:

- Use of yellow or red rain/ methyl isocyanate.(MIC)

Symptoms:

- Irritation of the eyes
- Lacrimation
- Blurring of vision
- Severe burning sensation of the throat
- Chest pain
- Labored breathing
- Death due to pulmonary oedema.

Treatment:

- Symptomatic.

BIOLOGICAL WEAPONS:

- These are micro organisms or toxins found in nature which can be used to incapacitate or kill the enemy.

- Bioterrorism is the deliberate release of viruses, bacteria, toxins or other harmful agents causing illness or death in people, animals or plants.
- The biological weapons are categorised into 3 categories:

1. Category A:

- These are high priority agents which can be easily transmitted and disseminated, result in high mortality and have major public health impact.
- Ex: Anthrax, Botulinum toxin, Bubonic plague etc.

2. Category B:

- These agents are moderately easy to disseminate and have low mortality rate.
- Ex: Brucellosis, Vibro cholera, Ricin and abrin.

3. Category C:

- These agents are emerging pathogens that might be engineered for mass dissemination because of their easy availability, ease of production, high mortality rate and ability to cause a major health impact.
- Ex: Nipah virus, H1N1, SARS etc.

Important Questions:

Short Answers:

1. Vishakta Vayu Lakshana and Chikitsa.
2. Vishakta Jala Lakshana and Chikitsa.
3. Vishakta Bhumi Lakshana and Chikitsa.
4. Dhava-ashwakarnadi Yoga.

Short Essay:

Environmental pollution.

Chaturvimshati Upakrama

Vishopakrama as Described by Acharya Charaka

Acharya Charaka has compiled 24 types of treatment principles as a general line of treatment in the cases of poisoning. They are:

मन्त्र अरिष्ट उत्कर्तन निष्पीडन चूषण अग्नि परिषेकाः । अवगाह रक्तमोक्षण वमन विरेक उपधानानि । ।
हृदयावरण अञ्जन नस्य धूम लेह औषध प्रशमनानि । प्रतिसारणं प्रतिविषं संज्ञासंस्थापनं लेपः ।

मृतसञ्जीवनम् ऐवच विंशतिरेते चतुर्भिरधिकाः । स्युरूपक्रमा..... ।। (च.चि. २३/३५-३७)

1. मन्त्र	:	Recitation of mantras
2. अरिष्ट	:	Ligature
3. उत्कर्तन	:	Excision of region of bite
4. निष्पीडन	:	Squeezing out of blood from site of bite
5. चूषण	:	Sucking out of poison from site of bite
6. अग्नि	:	Cauterization
7. परिषेक	:	Irrigation
8. अवगाह	:	Immersion of site of bite in medicated water
9. रक्तमोक्षण	:	Blood-letting
10. वमन	:	Emesis
11. विरेक	:	Purgation
12. उपाधान	:	Application of medicaments after incision over the scalp.
13. हृदयावरण	:	Protection of the heart
14. अञ्जन	:	Application of collyrium
15. नस्य	:	Inhalation of medicated oil etc.
16. धूम	:	Fumigation
17. लेह	:	Drugs given in the form of linctus given for licking.
18. औषध	:	Administration of anti-toxic drugs.
19. प्रशमन	:	Conservative treatment
20. प्रतिसारण	:	Rubbing of anti-poisonous powders

21. प्रतिविष : Administration of poisons to counter act the original poison.
22. संज्ञासंस्थापन : Restoration of consciousness.
23. लेप : Ointments/application of pastes.
24. मृत सन्जीवन : Measures for revival of life of an apparently dead person.

१. मन्त्र चिकित्सा:

Definition:

देवब्रह्म ऋषिभिः प्रोक्तमन्त्राः सत्यतपोमयाः । (सु.क. ५/९)

- Mantras/hymns are revealed by Gods like Brahma and great sages who are embodiments of truth and austerities.
- Mantra chikitsa is said to be the superior most line of treatment for removal of poisons. So it is the first line of treatment described in the chaturvimshati upakrama¹.
- Acharya Sushruta adds that the hymns are able to destroy the poison which are most difficult to cure. Hymns are said to be full of tejas and chanted by persons who indulge always in truth and spiritual knowledge and hence they eliminate the poison very quickly from the body, even better than the medicaments².

मन्त्र ग्रहण विधानः (Method of Recitation of Mantra):

While learning the mantras, one has to abstain himself from (women) stree, mamsa (meat), madya (alcohol) and madhu (honey). One should take little food, maintain proper hygiene of the body and should sleep on the mattress made with kusha grass.³

Such persons worshipping Gods by offering perfumes, garlands, oblations, repeated chanting of the mantras and sacrificial oblations, obtain success by mantra.⁴

Hymns chanted without adhering to these procedures and which are deficient by either sound or letters do not become successful, hence in such conditions antipoisonous treatments should be adopted.⁵

The mantra specified for different types of poisoning are described in Ayurveda Prakasha. (60th chap.)

२. अरिष्ट बन्धनः

Arishtabandhana is considered to be one of the emergency line of treatment of visha. The word 'Arishta' refers to the complications which are indicative of death. With regards to the condition of poisoning, the injected poisons enters the circulation from the point of entry

१. मन्त्रस्य विषहरेषु श्रेष्ठत्वात् अग्रे अभिधानम् । (चक्रपाणिदहच.चि. २३/३५)

२. भवन्ति न अन्यथा क्षिप्रं विषहन्त्युः सुदुस्तरम् । विषतेजोमयैर्मन्त्रैः सत्यब्रह्मतपोमयैः ॥ यथानिवार्यतेक्षिप्रं प्रयुवतैर्न तथौषधैः ॥ (सु.क. ५/९-१०)

३. मन्त्राणां ग्रहणकार्यस्त्रीमांसमधुवर्जिनामिहाहारेण शुचिना कुशास्तरणशायिना ॥ (सु.क. ५/११)

४. गन्धमाल्योपहारैश्च बलिभिश्चापि देवताः । पूजयेन्मन्त्रसिद्ध्यर्थं जपहोमैश्च यत्नतः ॥ (सु.क. ५/१२)

५. मन्त्रास्त्वविधिना प्रोक्ता हीन वास्वरवर्णतः । यस्मान्नसिद्धिमायान्तितस्माद्योज्योऽगद क्रमः ॥ (सु.क. ५/१३)

and then spreads in the body involving other organs and systems. The procedure of bandhana or tying of a ligature would help stop the arishta or complication of poisoning by arresting its spread. Hence the name arishtabandhana.

Types of Arishta Bandhana¹:

1. Arishta tied with chanting of mantra.
2. Arishta tied without chanting of mantra, with a rope or other materials.

Materials used for Arishta Bandhana:

Rope can be used to tie a ligature.²

Cotton thread, leather band or inner bark of trees or any other material which is soft in nature can be used for arishta bandhana.³

Procedure of Arishta Bandhana:

In all cases of snake bites in the extremities, arishtabandhana is done four angulas above the site of bite in such a manner that the spread of poison to other parts of the body is arrested.⁴ It can also be tied along with chanting of mantras, by a physician who is well-versed in it.⁵

Precautions:

The ligature should be tied properly depending on the nature of site of bite. It should neither be very tight nor very loose. If it is tight, it may produce bad smell, swelling etc at the site of bite whereas loose binding will not prevent the spread of poison to other places.⁶ If tied properly, just as water is obstructed from moving out by construction of a dam, so also the poison will be obstructed so that it would not flow through the vessels.

अम्बुवत् सेतुबन्धेन बन्धेन स्तब्धते विषम् । न वहन्ति सिराश्चास्य विषं बन्धाभिपीडिताः ।। (अ.सं.उ. ४२/७)

३. उत्कर्तन : (Excision of the Site of Bite:)

Excision or uddharana of the damshtra sthana from the shareera is utkartana.⁷

Procedure:

The poison remains for a period of one hundred matrakala, at the site of bite and then it spreads to blood and other tissues and vitiates them. So, within this period, the site of the bite must be excised so as to minimize its spread.¹

१. अरिष्टा द्विविधाः मन्त्रेणरज्वादिभिर्विषोपरिबन्धः। (चक्रपाणिदहच.चि. २३/३५)

२. सा तु रज्ज्वादिभिर्विषप्रातिकरीमता।। (सु.क. ५/९)

३. प्लोतचर्मअन्तवल्कानामृदुनाऽन्यतमेन वै।। (सु.क. ५/४)

४. सर्वैरेवादितः सर्पैः शाखादष्टस्यदेहिनः। दंशस्योपरिबन्धनीयादरिष्टाश्चतुरङ्गुले।।

५/३-४)

५. अरिष्टमपिमन्त्रैश्चबन्धनीयान्मन्त्रकोविदः।। (सु.क. ५/८)

६. बन्धोदेशानुसारेणनातिगाढ इत्यथोहितः। दंशपूतित्वशोफादीनकुरुते ह्यतिपीडितः अशक्तः शक्तः शिथिलोरोद्धुंविषंदेशानतरं व्रजत्।। (अ.सं.उ. ४२/६)

७. उद्धरेदितोत्कृत्यापहरेत्वा। (चक्रपाणि on च.चि. २३/३८)

.....नगच्छतिविषंदेहमरिष्टाभिर्निवर्तितम्।। (सु.क.

Contraindications:

Utkartana is contraindicated in marma sthana.²

Use of Utkartana:

As a tree stops growing as soon as its root is cut, similarly the effect of poison does not grow or spread as soon as its site is excised³.

४. निष्पीडन : (Squeezing):

निष्पीडयति निष्पीडनेन विषं गालयेत्। (चक्रपाणि on च.चि. २३/३८)

The procedure of removal of poison from the bite site by squeezing is called as निष्पीडन.

This procedure is done after arishtabandhana so as to remove the poison from the body.⁴

The fangs of snake which are not on vital spots should be pulled out by squeezing the area of bite. The symptoms of toxicity of poison will not develop if the fangs are removed, just as a sprout is lost when the seed is destroyed.⁵

Removing the teeth/fangs which are on vital spots leads to death and on the joints leads to distortions of the body.⁶

५. चूषणः

Chushana refers to sucking of the visha from the damsha sthana.

Acharya Charaka explains that the poison should be sucked out with the help of mouth filled with the flour of barley or dust.⁷

आचूषेत् पूर्ण वक्त्रोवा मृदस्म अगद गोमयैः। प्रच्छायान्तररिष्टायां मांसलं तु विशेषतः।। (अ.सं.उ. ४२/१०)

The physician should suck the poison filling his mouth earlier with either mud, ash, medicinal recipe or cow dung, through an incision made below the arishtabandhana, specially adopted on fleshy parts.

६. अग्नि कर्मः

त्वक् मांसगतं दाहो दहति विषम्। (च.चि. २३/४५)

Dahana karma is done to treat the poison located in the skin and flesh.

In case of bite by the mandali sarpa, dahana karma should not be done because the poison is predominant of pitta and cauterization may cause burning sensations locally and

१. मात्राशतं विषं स्थित्वा दंशेदष्टस्य देहिनः। देहं प्रक्रमते धातून् रुधिरादीन् प्रदूषयत्॥
एमस्मिन्नन्तरे कर्मदंशस्योत्कर्तनादिकम्। कुर्याच्छीघ्रं यथा देहे विषवल्ली न रोहति॥ (अ.सं.उ. ४२/३)
२. दंशमुद्धरेत् मर्मवर्जम्वा॥ (च.चि. २३/३८)
३. तरुरिव मूलच्छेदादंशच्छोदान्न वृद्धिमेति विषम्॥ (च.चि. २३/४४)
४. दंशानुविषं दष्टस्य अविस्त्रुतं वेणिकां भिषग्वद्वानिष्पीडयेत् भृशं। (च.चि. २३/३९)
५. निष्पीडय चोद्धरे दंशं मर्मसन्धिगतं तथा। न जायते विषवेगो बीजनाशादिवाङ्कुरः॥ (अ.सं.उ. ४२/८)
६. मर्मगेषां प्राप्नुयान् मृत्युं सन्धिस्थे विकलाङ्गताम्॥ (अ.सं.उ. ४२/८)
७. तदंशं वाचूषेन्मुखेन यवचूर्णपांशुपूर्णेन। (च.चि. २३/३८)

the poison spreads to other places.¹

Except such bites of mandali snakes which is pitta predominant, all other bites should be cauterized by heated rods of gold, iron etc or even by a burning faggot. Agnikarma destroys the poison immediately just as the fire converts everything into ash, even earlier than a second.²

७. परिषेकः

विषं अत्यर्थम् उष्णञ्चतीक्ष्णं च कथितं यतः ।

अतः सर्व विषेषूक्तः परिषेकस्तु शीतलः ॥ (भा.प्र. मध्यखण्ड ६७/७६)

As visha is ushna and teekshna in nature, it should be treated with sheetala parisheka, i.e. parisheka with sheeta veerya dravyas.

Acharya Sushruta has described parisheka to be done with drugs like chandana and usheera.³

Acharya Vagbhata advises parisheka to be done after raktamokshana so that the blood left inside after the raktamoshana, which may be liquefied by the heat of the poison may be arrested by lepa or parisheka with sheetala dravyas.⁴

Acharya Charaka opines that blood is the vehicle of poison as the wind is of fire. With the help of pradeha and seka with drugs of sheeta veerya, the blood gets coagulated and so it arrests the virulent spread of the poison⁵.

८. अवगाहः

The procedure of avagaha involves immersion of the affected part in a medicated decoction or oil.

९. रक्तमोक्षणः

- Bloodletting eliminates the poison from the blood and hence is considered as the best remedy for poison that has entered the blood.^{6,7}
- If poisoned blood is not removed out, it destroys everything. The vitiated blood spreads through the body and causes death. Therefore, it must be made to flow out by different

१. अथ मण्डलिनादष्टनकथंचनदाहयेत्। स पित्तबाहुल्यविषादं शोदाहाद्विसर्पते ॥ (सु.क. ५/७)

२. दंशं मण्डलिनामुक्त्वा पित्तलत्वा दथापरम्। प्रतप्तैर्हंमलोहाद्यैर्हृदि दाशूलमुकेन वा ॥

करोति भस्मसात्सद्यो वह्निः किं नाम च क्षणात् ॥ (अ.सं.उ. ४२/९)

३. चन्दनोशीरयुक्तेन वारिणा परिषेचयेत् । (सु.क. ५/१६)

४. शोणितं सुतशेषं च प्रविलीनं विषोष्मणा ।

लेपसेकैः सुबहुशः स्तम्भयेद् भृशं शीतलैः ॥

५. रक्तं हि विषाधानं वायुरिवाग्नेः प्रदेहसेकैस्तत्शीतैः स्कन्दति ।

६. ... विषं स्लावणं हरति रक्तात् । (च.चि. २३/४५)

७. विषे प्रविसृते विध्येत्सिरासापरमाक्रिया। रक्ते निहितमाणे हि कृत्स्नं निहितं विषम् ॥ (अ.सं.उ. ४२/१२)

methods of raktamokshana and excess flow should be stopped to protect life.¹

- Blood containing poison is foul smelling, makes cracking sound when put into the fire and has signs resulting from the aggravated dosa. Blood exhibiting such signs and symptoms should be let through raktamokshana.² Also if the body afflicted with poison is found discolored, hard, swollen and painful, then blood letting should be done quickly according to the procedure described in the classics.³
- Raktmokshana is contraindicated in case of an infant, old man or a pregnant woman.⁴

Procedure:

- In all cases of snake bite, an expert physician should puncture the vein near the site of bite, either in the extremities or in the forehead and let out the blood. By allowing the blood to flow out, the poison also goes out quickly; hence bloodletting should be done immediately.⁵
- Bloodletting should be performed by pracchana, (scratching with the help of rough surfaced instruments), sringa (application of horn), jalouka (application of leeches) or siravyadhana (venesection).⁶
- The blood afflicted by poison causes vitiation of the very prakriti of the person, leading to death. Therefore, if the blood does not come out of the site of bite, then pragharsana should be employed to cause the blood to flow out.⁷
- For this purpose, pragharsana/rubbing should be done with the help of the powder of shunti, pippali, maricha, grahadhuma, rajani, panchalavana and vartaka.⁸
- Anyhow if atipravritti of rakta is noticed, that is, if the blood is let out in more quantity, then it should be stopped using sthambhana procedures in order to prevent mrityu or protect life.
- If the blood does not clot or does not stop flowing out due to the power of poison, fainting, toxicity, increased heart rate etc develops. These should be treated by cold therapies and by fanning the patient till he gets horripilation.⁹

१. दुष्टेहिव्याप्नुयादङ्गं ध्रुवं मृत्युर्भवत्यतः। सिराव्यधोदितैरस्त्रमप्रवृत्तं प्रवर्तयेत्॥
स्तम्भयेदतिवृत्तं च तैरेव प्राणरक्षया॥ (अ.सं.उ. ४२/१४)
२. दुर्गन्धं सविषं रक्तमग्नौ चटचटायते। यथादोषं विशुद्धं च...। (अ.सं.उ. ४२/१५)
३. विवर्णे कङ्गिने शूने सरुजेऽङ्गे विषान्विते। तूर्णं विस्त्रवणं कार्यमुक्तेन विधिना ततः॥ (सु.क. ५/३६)
४. गर्भिणी बाल वृद्धानां सिराव्यधनवर्जितम्॥ (सु.क. ५/३०)
५. समन्ततः सिरादंशाद्विधेत्कुशलोभिषक्। शाखाग्रेवालालाटे वा व्यध्यास्ताविसृते विषे॥
रक्ते निर्हियमाणे तु कृत्स्नं निर्हियते विषम्॥ तस्माद्विस्त्रावयेद्रक्तं सा ह्यस्य परमाक्रिया॥ (सु.क. ५/१४)
६. प्रच्छन्नं शृङ्गं जलौकव्यधनैः स्त्राव्यन्तोरक्तम्॥ (च.चि. २३/३९)
७. रक्ते विषप्रदुष्टे दुष्टे तत्प्रकृतिस्ततस्त्यजेत्प्राणान्। यस्मात्प्रधर्षणैरसृगवर्तमानं प्रवर्त्य स्यात्॥ (च.चि. २३/४०)
८. त्रिकटु गृध्रमृजनीपञ्चलवणरोचनाः सवार्तकाः। धर्षणम् अतिप्रवृत्ते वटादिभिः शीतलैर्लेपः॥ (च.चि. २०/४१)
९. अस्कन्ने विषवेगाद्धि मूर्च्छायामदहद्द्रवा भवन्ति तान् जयेच्छीतैर्वीजेच्चाऽऽरोमहर्षतः॥ (अ.सं.उ. ४२/१८)

દરમાં વમન કરાવવું હોય તો → ગમક પાણી

→ monster પાણી

૧૦. વમન: (આમાશયગત વિષ)

- Vamana or emesis is the first line of treatment for ingested poison.¹
- In general, a patient who is affected with a poison marked by predominance of aggravated kapha and having fainting and intoxication should be administered treatments which mitigate kapha and made to vomit using strong emetics.²
- Also, those bitten by snake which are of kapha temperament and those bitten on parts of the body above the umbilicus must be made to vomit.³
- The person who has ingested poison is given the liquids which are both vishagna and vamaka in nature and are made to vomit as the poison is expelled out easily by vomiting.⁴
- By the different procedures of hridayavarana, kapha gets increased and accumulates in the heart producing feeling of heaviness, salivation and nausea and therefore the patient should be made to vomit using emetic drugs which are antipoisonous. Liquids like sour gruel, soup of horse gram, oil, wine etc should be avoided for vamana as it may facilitate the spread of kapha to the entire body.⁵

૧૧. વિરેચન: (પકવાશયગત વિષ)

- Virechana or purgation is indicated in the second stage of poisoning.⁶
- The person who has burning sensation and pain in abdomen, flatulence, pain and obstruction of urine, faeces or flatus should be made to purge.⁷
- The person of pitta prakriti, bitten by a snake of pitta predominant features and bite being in parts below the umbilicus, if the poison is found localised in the pakvashaya- in such patients virechana is to be administered with drugs like:

- (a) Danti, niliphala consumed with milk or mastu
- (b) Fine powder of kumbha with decoction of triphala
- (c) Powder of trivrit, syama, surasa and nilini with milk⁸.

૧. પીતંવમનૈઃ સઘોહરેત્ ... (ચ.ચિ. ૨૩/૪૫)

૨. શીતેશીતપ્રસેકાર્તશ્લેષ્મિકંકફકૃદ્વિષમ્। વામયેત્વમનૈસ્તીક્ષ્ણૈસ્તથામૂર્છામદાન્વિતમ્॥ (સુ.ક. ૫૮/૩૯)

૩. વામયેતતતશ્ચૈન્નવિષશેષોપશાન્તયે। શ્લેષ્મલંશ્લેષ્મલૈર્દઘં નાભેરુર્ધ્વવિશેષતઃ॥ (અ.સં.૩. ૪૨/૫૯)

૪. દ્રવમન્યતુયત્કિન્નિત્ત્વીત્વાપીત્વાતદુદ્ધમેત્। પ્રાયોહિવમનેનૈવસુખંનિર્હિયતેવિષમ્॥ (સુ.ક. ૫/૧૯)

૫. હૃદયાવરણેન શ્લેષ્મા હૃદુપચીયતે। પ્રવૃત્તગૌરવોત્ક્લેશહલ્લાસં વામયેત્તતઃ॥

દ્રવૈઃ કાઝિકકૌલત્યતૈલમઘાદિવર્જિતૈઃ। વમનૈર્વિષહ્રદિશ્ચ નૈવં વ્યાપ્નોતિ તદ્વપુઃ॥ (અ.સં.૩. ૪૨/૧૬)

૬. વિરેકૈર્દ્વિતીયે તુ॥ (ચ.ચિ. ૨૩/૪૫)

૭. કોષ્ઠદાહ રુજઆધ્માનમૂત્રસઙ્ગ રુગન્વિતમ્। વિરેચચયેચ્છકૃત્વાયુસઙ્ગ પિત્તાતુરંનરમ્॥ (સુ.ક. ૫/૪૦)

૮. પૈત્તિકં પૈત્તિકૈર્દૃષ્ટમઘોનાભેર્વિશેષતઃ। વિષેપિત્તાશયગતેપાયયેતવિરેચનમ્॥

સનીલીફલદાંદન્તીપયસામસ્તુનાથવા। શ્લક્ષ્ણચૂર્ણીકૃતંકુમ્ભંકવાથેન ત્રૈફલેનવા। ક્ષીરેણવાત્રિવૃદ્ધયામાસુરસાનીલીનીરજઃ॥ (સુ.ક. ૫/૬૩-૬૪)

- When kapha is predominant, a purgative recipe with pinditakaphala, vyosa, trivrit, vella, haritaki and lavana (saindava) along with gomutra is ideal.¹
- If vata is predominant, niliniphala added with saindhava lavana and consumed with ghee is ideal.²

Procedure of Virechana:

शयनः शयने छिद्रे विरेच्यो विषपीडितः । मुहुरुत्तिष्ठतो ह्यस्य विषं दूषयतेनिलम् ।। (अ.सं.उ. ४२/६७)

The patient suffering from poisoning should be made to purge lying on the cot which has a hole for voiding the faeces because frequent getting up will cause aggravation of vata. After vamana and virechana, the patient should drink vishanashaka yavagu.³

१२. उपधान चिकित्सा:

उपधानं विषसङ्क्रमणार्थं मस्तके भेषजादानम् । (चक्रपाणिदहच.चि. २३/३५)

Upadhaana chikitsa is a treatment in visha chikitsa where in visha is taken out from the mastaka by applying medicaments.

विषदूषित कफमार्गः स्रोतः संरोध रुद्धवायुस्तु । मृत इवश्चसेन्मर्त्यः स्यात् असाध्यलिङ्गैर्विहीनश्च ।।

चर्मकषायाः कल्कं बिल्वसमं मूर्ध्नि काकपदमस्य कृत्वा । दद्यात्कटभी कटुकट्फल प्रधमनं च ।।

When the channel of circulation of kapha gets vitiated by poison, it causes obstruction in the channels because of which the movement of vayu gets obstructed. As a result of this, the patient breaths as if he is going to die very soon. If he is free from the signs and symptoms of incurability, then incisions should be made on his scalp resembling the feet of the crow (kākapāda) and one bilva of the paste of charmakashaya (Saptalā) should be applied over it. He may also be given pradhmana nasya with katabhi, katu (trikatu) and kat phala.

छागं गव्यं माहिषं वा मांसं कौक्कुट मेव वा । दद्यात् काकपदे तस्मिस्ततः संक्रमते विषम् ।। (च.चि. २८/६७)

Over the kakapada, the meat of goat, cow, buffalo or cock should be applied which will absorb the poison from the body.

Poison localized in the head should be won over quickly by sankramana procedure. If the snake bite is in the lower parts of the body, an incision resembling the foot of a crow should be made on the head (allowing for bleeding) and then over it, a piece of muscle containing blood which is taken from animals such as crow, cock, peacock, goat, ox, buffalo or hen is placed over the incision. If the bite is in the upper parts of the body, this should be done in the feet. By this, the poison travels from the body into that muscle and saves the person.⁴

१. पिण्डीतकफलं व्योषं त्रिवृद्वेल्लं हरीतकी । विरेचनं कफप्राये लवणं मूत्रसम्प्लुतम् ।। (अ.सं.उ. ४२/६५)
२. घृताप्लुतं सलवणं मारुते नीलिनीफलम् ।। (अ.सं.उ. ४२/६६)
३. पिबेद्वान्तो विरिक्तो वायवागूं विषनाशिनीम् ।। (अ.सं.उ. ४२/६७)
४. जयेत् सङ्क्रामणैराशुविषं शिरसि संक्षितम् । दद्यादधस्तादष्टस्य मूर्ध्नि काकपदे कृते ।
काकदक्षशिखिच्छागगव्यमाहिष कौक्कुटम् । बिल्वप्रमाणं मांसं स्रग्मूर्ध्वदष्टस्य पादयोः ।।
विषं सङ्क्रमते तत्र निहन्याच्छीघ्रमन्यथा ।। (अ.सं.उ. ४२/५६-५७)

१३. हृदयावरणः

- Hridayaavarana is the procedure of protection of the heart from the adverse effect of poison using certain medicaments.

हृदयावरणं हृदय रक्षाकरम् औषधम्। (चक्रपाणिदहच.चि. २३/३६)

विषं कर्षति तीक्ष्णत्वात् हृदयं तस्य गुप्तये। पिबेत् घृतं घृतक्षौद्रम् अगदं वा घृताप्लुतम्।। (अ.सं.उ. ४२/१९)

Poison by its penetrating property weakens the heart, so in order to protect it, the patient should be made to drink ghee mixed with honey or any anti-poisonous drugs added with more of ghee.

आदौ हृदयं रक्ष्यं तस्यावरणं पिबेद्यथा लाभम्।। (च.चि. २३/४६)

First the heart of the patient should be protected and whatever is available for protection of heart must be administered to him.

Substances Used for Hridayaavarana:

- Marrow of animals²
- Juice of fresh cowdung
- Solution of ash
- Solution of black mud
- Panchagavya- Cows milk, curds, ghee, urine and dung.
- Curds
- Solution of gairika
- Bark of kovidara, arka, sirisa and katabhi be eaten³.
- Children, old persons and women may drink blood of goat, sheep or boar.
- Pregnant woman may drink milk added with anti-poisonous drugs of cold potency. By intake of these drugs fainting etc does not recur, and poison gets lost but not anila/life.
- Honey⁴
- Bone-marrow
- Red ochre
- Well boiled sugar cane juice
- Ghee
- Milk
- Juice of cow-dung
- Juice squeezed out of meat of crow

१. जयेत् सङ्गामणैराशुविषंशिरसिसंक्षितम्। दद्यादधस्तादृष्टस्यमूर्ध्नि काकपदेकृते।

काकदक्षशिखिछागव्यमाहिष कौक्कुटम्। बिल्वप्रमाणं मांसास्त्रमूर्ध्वदृष्टस्यपादयोः॥

विषंसङ्क्रमते तत्र निहन्त्याच्छीघ्रमन्यथा॥ (अ.सं.उ. ४२/५६-५७)

२. मज्जानंगोमयरसंभस्माम्भंकृष्णमृज्जलम्। ऐकध्यं पञ्चगव्यं वा दधिगैरिकवारिवा॥ (अ.सं.उ. ४२/२०)

३. खादेद्वा कोविदारार्कशिरिष कटभीच्छद्वा न। छागमेष वराह असृक्शिशुस्थविरयोषितः।

पिबेयुर्गर्भिणीशीतमधुरान्पयसागदान्। तथामूर्च्छादयो न स्युर्विषं चाश्चेति नानिलम्॥ (अ.सं.उ. ४२/२१-२२)

४. मधुसर्पिमज्जापयोगैरिकमथगोमयरसंवा। वक्षुसुपक्वमथवाकाकं निष्पीड्य तद्रसं वरणम्।

छागादीनां वा असृग्भस्ममृदं वा पिबेदाशु॥ (च.चि. २३/४७)

- Blood of goat etc

- Ashes or mud diluted with water.

पश्चात्कर्म for हृदयावरणः

Following hridayaavarana the kapha gets increased and accumulates in the heart producing a feeling of heavyness, salivation and nausea and hence the patient should be made to vomit using emetic drugs which are antipoisonous also.¹

१४. अञ्जनः → शीत, तीक्ष्ण

The person who has swelling around the eyes, is troubled by loss of sleep, eyes discoloured and dirty and vision also being unclear, should be treated by applying collyriums.²

अञ्जनम् अक्ष्युपरोधे कर्तव्यम्। (च.चि. २३/६९)

Anjana is done when there is obstruction to the eyes.

Medicaments used for Anjana:

- Devadaru, sunti, pippali, marica, haridra, karavira, karanja, nimba and surasa triturated with goat's urine.³
- Pippali, marica, yavakshara, vaca, saindhava and sigru macerated with bile of rohita fish and applied as anjana destroys the poison present in the eye.⁴
- Candana, madhuka, mamsi, pippali, marica, utpala and saindhava macerated with bile of a cow is best for anjana.⁵

Pashchat Karma for Anjana:

After the use of strong nasya and anjana, ghee should be drunk in larger dose, because poison by its penetrating property destroys the eye which is dry and irritating.⁶

Anjana used in Visha Chikitsa:

- Garudaanjana⁷
- Choornanjana⁸
- Vachaadi anjana⁹
- Surasaadi anjana¹⁰

१. हृदयावरणेन अस्य श्लेष्मा हृद्युपचीयते। प्रवृत्तगौरवोत्क्लेशहल्लासं वामयेत्ततः॥ (अ.सं.उ. ४२/२३)
२. शूनाक्षिकूटं निद्रार्तविवर्णाविलोचनम्। विवर्णचापि पश्यन्तमञ्जनैः समुपाचरेत्॥ (सु.कं. ५/४१)
३. अञ्जनं अक्ष्युपरोधे कर्तव्यं बस्तमूत्रपिष्टं तु। धरु व्योष हरिद्राकरवीरकरञ्जनिम्बसुरसैस्तु॥ (च.चि. २३/६९)
४. पिप्पली मरिच क्षारवचासैन्धवशिग्रुकाः। पिष्टारोहितपित्तेन घन्त्यक्षिगतमञ्जनात्॥ (अ.सं.उ. ४२/४८)
५. चन्दनमधुकं मांसीपिप्पलीमरिचोत्पलम्। सैन्धवंचाञ्जनं श्रेष्ठं गवां पित्तेन कल्कितम्॥ (अ.सं.उ. ४२/४९)
६. तीक्ष्णनस्य अञ्जनान्ते च भूरिमात्रं पिबेत् धृतम्। विषं हि नेत्रं रुक्षस्य तीक्ष्णैर्हन्ति समीरितम्॥ (अ.सं.उ. ४२/५८)
७. वारिमुञ्जाफलोशीरं नेत्रयोर्विषदुष्टयोः। अञ्जनं वारिणापिष्टं गारुडं गरुडोपमम्॥ (अ.सं.उ. ४२/५१)
८. समुद्रफेनं मरिचं कणासौ वीरकाञ्जनम्। चूर्णाञ्जनं ससिन्धुत्वं विषोपहतचक्षुषम्॥ (अ.सं.उ. ४२/५२)
९. अ.सं.उ. ४४/६६
१०. शुरसप्रसवव्योष विल्वमूलसुराहवयम्। हरिद्राछागलीमूत्रं लूता कीटध्नमञ्जनम्॥ (अ.सं.उ. ४४/६९)

१५. नस्यः → शीत, तीक्ष्ण।

शिरोगते विषे मूलं नस्यकर्मणि योजयेत्। (अ.सं.उ. ४२/४६)

When poison is present in the head, nasal medicaments should be applied.

नासाक्षि कर्ण जिह्वा कण्ठ निरोधेषु कर्म नस्तः स्यात्। (च.चि. २३/६८)

If there is obstruction to the nose, eyes, ears, tongue and throat, then patient should be given nasya. When there is pain and feeling of heaviness of the head, lassitude, rigidity of the lower jaw, obstruction in the throat and severe catching pain in the neck, then purgation to the head should be given quickly.¹

Medicaments Used in Nasya:

- Paste of vartaka, bijapura, jyotismati etc.²
- Roots of bandhujiva, bharangi and black variety of surasa.³
- Powder of pippali, hingu, vriscikali, manashila, sirishabija, apamarga and lavana.⁴
- Powder of krisna, ksavaka, ativisa and usana.⁵

१६. धूमः

- Dhuma is the process of administration of medicated smoke which helps to clear off all the blocked channels, inturn stabilizing the respiratory system.
- The smoke is produced by combustion of antitoxic drugs, which when administered nullifies the adverse effect of poison.
- Dhoomagada is one of the unique combinations mentioned for Dhooma which is prepared by using tagara, kushta, head of a serpent and shireeshapushpa added with ghee.
- This combination destroys all types of poison and oedema produced by poison.⁶
- Dhooma with peacocks feather, crane's bone, sarshapa and candana added with ghee in home, beds, seats and clothes cures ailments caused by poisoning.⁷

In case of vrischika visha damsha, where swedana is contra-indicated, there dhoopana is indicated.⁸

१. शिरो रुक्गौरवआलस्यहनुस्तम्भगलग्रहे। शिरोविरेचयेत्क्षिप्रंन्यास्तम्भेचदारुणे॥ (सु.क. ५/४२)

२. वार्ताकु बीजपूरज्योतिष्मत्यादिभिः पिष्टैः॥ (च.चि. २३/६८)

३. शिरोगतेविषेनस्तः कुर्यान्मूलानिबुद्धिमान्। बन्धुजीवस्यभार्ग्याश्च सुरसस्यासितस्यच॥ (च.चि. २३/१८१)

४. अथवापिप्पलीहिङ्गु वृश्चिकालीमनशिशलाः। शिरीषबीजअपामार्गलवणंचेतनाकरम्॥

५. कल्कचूर्णोथवाकृष्णाक्षवकातिविषोषणात् ॥ (अ.सं.उ. ४२/४७)

६. घृतयुक्तेनतकुष्ठेभुजगपतिशिरः शिरीषपुष्पंच। धूमागदः स्मृतोऽयंसर्वविषघ्नः श्वयथुहृच्च॥ (च.चि. २३/९९)

७. शिखिबर्हिबलाकास्थानि सर्षपाश्चन्दनंचघृतयुक्तम्।

धूमोगृह शयनअसनवस्त्रादिषुशस्यतेविषनुत्॥ (च.चि. २३/९८)

८. नस्वेदयेत्चादंशंधूमंवक्ष्यामि वृश्चिके। (सु.क. ८/४५)

૧૭. અવલેહ:

- Lehya is a form of medicine which is most palatable.
- Dryness of the mouth and throat is a common presentation in all cases of poisoning and hence immediate medication is necessary which is easily digestible and avalehas are most opted in such conditions.
- Avalehya prepared with sugar, honey, powder of tapya and suvarna licked will mitigate powerful symptoms of all kinds of poisons.¹
- Lehya prepared with powder of bark of arjuna mixed with honey and ghee must be given to a patient after administration of strong prativisha².

૧૮. ઔષધ:

Aushada prayoga involves use of several antitoxic remedies in different conditions of poisoning.

यस्य यस्यहि दोषस्य लिङ्गाधिक्यानि लक्षयेत्।

तस्य तस्यौषधैः कुर्योद्विपरीत गुणैः क्रियाम्।। (च.चि. ૨૩/૧૬૬)

To treat the patient afflicted with poison, the physician should employ therapeutic measures having attributes opposite to the aggravated dosas which can be ascertained from the manifested signs and symptoms. Some examples of aushadha-yogas mentioned in the context of visha chikitsa include:

મૃતસંજીવનિયોગ	-	ચ.ચિ. ૨૩/૫૪
ધૂમાગદ	-	ચ.ચિ. ૨૩/૯૭
ક્ષારાગદ	-	ચ.ચિ. ૨૩/૧૦૧
પચ્છશિરીષ અગદ	-	ચ.ચિ. ૨૩/૨૧૮
અમૃતઘૃત	-	ચ.ચિ. ૨૩/૨૪૨
અજિતાગદ	-	સુ.ક. ૫/૬૩
એકસર યોગ	-	સુ.ક. ૫/૭૪
કલ્યાણક સર્પિ	-	સુ.ક. ૬/૯
દશાંગ અગદ	-	અ.સં.૩. ૪૩/૩૧
લશુનાદિ યોગ	-	અ.સં.૩. ૪૬/૫૩

૧૯. પ્રશમન: → poison ની ચિકિત્સા time એ ડોઝ દોષનો પ્રકાર ધ્યાન તો રહે
 • Vigorous line of treatments is applied in condition of poisoning. Anyhow following such treatments, little amount of poison may remain un-eliminated in the body and to remove such remnant poison out of the body, prashamana is done.

૧. શર્કરા ક્ષૌદ્રસંયુક્તચૂર્ણસ્તાપ્યસુવર્ણયોઃ। ઢોહ: પ્રશમયત્યુગ્રંસર્વયોગકૃતંવિષમ્।। (અ.સં.૩. ૪૦/૧૧૯)

૨. વિષઽવચારિતે તીક્ષ્ણોપેયંઘૃતમનન્તરમ્।.....લિહયાદ્રામધુસર્પિર્ભ્યાંચૂર્ણિતામર્જુનત્વચમ્।।(અ.સં.૩. ૪૮/૧૩)

- For example, following raktamokshana, lepa and pariseka using candana and usheera is done which is considered as prashamana chikitsa.
- Following vamana-virechana, lepa-seka and oushadaprayoga is done as prashamana. If the avashishta visha/dosa is neglected, the visha may spread all over the body and may even lead to death of the patient.

૨૦. પ્રતિસારણ:

- Pratisarana means praghharshana.¹

Pratisarana is indicated in case blood fails to come out of the site of bite during raktamokshana.

- It is employed by rubbing with the powder of sunthi, pippali, marica, graha-dhuma, rajani, panchalavana and vartaka.²
- If kapha is aggravated because of poisoning, then the paste of pippali, nagara and ksara triturated with butter should be applied over the site of bite for pratisarana.³

૨૧. પ્રતિવિષ: → substance ખુદ poison હોય પરંતુ બીજા poison ની Against હોવાથી Use કરી શકાય.

Prativisha prayoga involves use of a visha draya to nullify the effect of another visha.

પ્રતિવિષં વિષાન્તર પ્રયોગ: (ચક્રપાણિદહચ.ચિ. ૨૩/૩૯) અફીણ poison છે પરંતુ કુપિતો વિષપાનં દદ્યાનાં વિષપીતે દંશનં ચાન્તે। (ચ.ચિ. ૨૩/૫૦) ની ચિકિત્સામાં Use કરી શકાય

At the end, the patient should be given poison to drink if he is afflicted with the poison caused by bite. If he is afflicted by the poison taken orally, then he should be made to be bitten by poisonous animals.

પાંચમા વેગ પછી, સાતમા વેગ પહેલાં

વિષે પ્રતિવિષં યોજ્યં મન્ત્ર તન્નૈરસિધ્યતિ। અતીતે પચ્ચમે વેગે સપ્તમસ્યાનાતિક્રમે।। (અ.હ.ઉ. ૪૮/૨)

- When the effects of poison does not subside by curative hymns and drug administration, after the lapse of the fifth stage and before the lapse of seventh stage, counter poison has to be administered.
- Sthavara visha generally possess the properties similar to kapha and spreads upwards whereas jangama visha possess properties of pitta and spread downwards, thus the two kinds of poison possessing opposite qualities when put together destroy each other. Hence he who is bitten by snake etc should be administered sthavara visha in the form of pana and lepa. The person who has consumed sthavara should be bitten by a snake because nothing is equal to poison to neutralise a poison.⁴

૧. પ્રઘર્ષણેનપ્રતિસારણમ્પ્રક્રમેષુઘ્નનમ્ ॥ (ચક્રપાણિદહચ.ચિ. ૨૩/૩૯)

૨. થસ્માત્પ્રઘર્ષણૈરસુગવર્તમાનંપ્રવર્ત્યસ્યાત્।

ત્રિકટુગૃહધૂમરજનીપશ્ચલવર્ણોચનાઃ સવાર્તાકાઃ ઘર્ષણમ્ ॥ (ચ.ચિ. ૨૩/૪૦)

૩. પિપ્પલી નાગરં ક્ષારંનવનીતેનમૂર્ચ્છિતમ્ ॥ કફેભિષગુદીર્ણે તુ વિદધ્યાત્રપ્રતિસારણમ્ ॥ (ચ.ચિ. ૨૩/૧૮૯)

૪. શ્લેષ્મતુલ્યગુણપ્રાયઃ સ્થિરમૂર્ધ્વગમંવિષમ્ ॥ પ્રાયઃ પિત્તગુણૈર્યુક્તમધોગામિચજઙ્ગમ્ ॥

ગુણૈરિતિવિપર્યસ્તૈર્નિહતસ્તેપરસ્પરમ્ ॥ યુક્ત્યાન્મૂલવિષંતસ્માદદ્યાનાંપાનલેપયોઃ ॥ વિષપીતંચકુશલોદંશયેત્પવનાશિભિઃ ॥ (અ.સ.ઉ. ૪૮/૩-૫)

न विष प्रतिमं किञ्चित् निर्विषीकरणं विषे। (अ.सं.उ. ४८/५)

प्रतिविष प्रयोगविधि : Procedure of Administration of Prativisha

The patient who has been purified by shodhana karma by the use of ghee, who is partaking only healthy foods, who is pure in mind should be administered prativisha after sunrise and during winter and spring seasons generally and in summer for emergency only.¹

Contraindications:

- It should not be administered during rainy season.
- On cloudy days.
- Not to those who are in anger.
- Suffering from diseases of pitta.
- To the impotent.
- Not to the king or the brahmana.
- Not to those who are suffering from hunger, thirst, exertion, sun, light, long term disease, the pregnant woman, children the aged, those who are dry and those suffering from diseases of vital organs.²

Things Forbidden During Prativisha Prayoga:

Use of katu, amla, taila, lavana, divaswapna, sunlight, fire and dry foods especially as these may cause indigestion always.³

Dose of Prativisha:

Dose of Moola Visha in Case of Sarpa Damsha: [प्रतिविष पत्सनालनी मात्रा]

Heena matra	-	4 yava
Madhyama matra	-	6 yava
Uttama matra	-	8 yava
In keeta visha	-	2 yava
In vrischika visha	-	1 tila pramana
In loota visha	-	Oral administration is not advisable prativisha is applied over the site of bite after incising it. ⁴

सविषे युक्तममृतं विषमेवाऽविषे विषम्।। (अ.सं.उ. ४८/८)

१. घृतोपस्कृतदेहस्यविशुद्धस्थहिताशिनः। सात्विकस्योदितेभानौयोज्यंशीतवसन्त्ययोः॥ (अ.सं.उ. ४८/२२)
२. न च वर्षासुदुर्दिने। न क्रोधनेनपित्तार्तेनक्लीबेराजनिद्विजे।
क्षुत्तृष्णाश्रमघर्माध्वव्याध्यन्तरनिपीडिते॥ गर्भिणीबाल वृद्धेषुन रुक्षेषुनमर्मसु॥ (अ.सं.उ. ४८/२४)
३. कटुअम्लतैललवणदिवास्वप्नप्रातपानलान्। रुक्षमन्त्रविशेषेणभयंवाऽजीर्णतः सदा॥ (अ.सं.उ. ४८/२६)
४. चतुर्भिः षड्भिरष्टाभिर्हीनमध्योत्तमांयवैः। मात्राविषस्यमौलस्यप्रयुञ्जीतयथायथम्॥

Prativisha acts like amrita/nector when administered to wounds or to persons who have poison in them. Anyhow it acts as a poison by itself if administered to a person who has no poison in him.

Examples of Prativisha:

Among the mahavisha explained, saktuka, mustaka, sringi, valaka, sarsapa and vatsanatha are safe acting prativisha as they are snigdha, ghana and guru.

The rest are not to be administered, specially kalakuta.¹

Among the above said drugs, only vatsanabha is identified.

- Visha consumed with milk, honey and ghee destroys poison.²
- Along with sinduvara and tagara, it is called mritasan- givana.³
- Visha along with flowers of sirisa and vakra destroys rat poison.⁴
- Visha with devadaru, nata, mamsi, dramili, bakuci and kushta destroys all kinds of poisons.⁵

Sarpa Visa Prayoga as प्रतिविषः

- A hooded serpent which has been enraged and found emitting fumes from its mouth should be made to bite many times on a piece of meat fastened to the tip of a stick.
- The physician, after carefully deciding the strength of the poison, should administer the powder of this meat to the patient of poisoning, who has not been cured by any other anti-poisonous medicines.⁶
- Even in any other diseases, when all other methods of treatment fail, snake poison can be administered.⁷

There is mentioning of prativisha prayoga with several other drugs, to cure several diseases or complications of visha.

२२. संज्ञास्थापनः

consciousness

Sanjna-samsthapana is a procedure which is followed to revive the conscious state of an unconscious person.

- Acharya Charaka advises Sanjna-samsthapana during the sixth stage of spread of poison.⁸

१. सक्तुकं मुस्तकं शृङ्गीवालकं सर्षपाहवयम् । वत्सनाभं च कर्मण्यं विषं स्निग्धं घनं गुरुम् ॥

न जातव्यं न्युत्प्रयोक्तव्यं कालकूटं विशेषतः ॥ (अ.सं.उ. ४८/११)

२. क्षीरं क्षौद्रघृतैर्युक्तं पीतं हन्ति विषं विषम् ॥ (अ.सं.उ. ४८/१४)

३. ससिन्दुवारतगरं मृतसञ्जीवनं विषम् ॥ (अ.सं.उ. ४८/१४)

४. शिरीषकुसुमं वक्रं विषमाखुविषापहम् ॥ (अ.सं.उ. ४८/१५)

५. देवदारु नतं मांसीद्रामिलीबाकुचीविषम् । कुष्ठं च पानलेपाभ्यां समस्तविषनाशनम् ॥ (अ.सं.उ. ४८/१६)

६. यस्तु संरोषितो भोगी धूमं वक्त्रद्विमुञ्चति । दण्डाग्रेषु शितं बध्वन्नुहशस्तेन दंशयेत् ॥

अशक्यमगदैन्यैर्विषपीतं चिकित्सकः । पाययेन्मांसचूर्णतं ज्ञात्वा विषबलाबलम् ॥ (अ.सं.उ. ४८/१९-२०)

७. अन्येष्वपि च रोगेषु शोषोपायपरिक्षये । विषयुञ्जीत ॥ (अ.सं.उ. ४८/२१)

८. ...अथ षष्ठे संज्ञायाः स्थापनं कार्यम् । (च.चि. २३/४९)

- Acharya Sushruta advises the following procedure for sanjna-sthapana.
- a) The person who is suffering from the effects of poison, when unconscious, with eyes wide open and neck bent, he should be administered strong pradhanana nasya with powder of antitoxic drugs.¹
- b) Venesection/siravyadha should be done immediately to the veins of the fore head and extremities of the patient.²
- c) If desired bleeding does not appear, expert surgeon must go for kakapada chikitsa as already explained.³
- d) A drum/dundubhi smeared with antipoisonous drugs should be beaten near patients ears.⁴
- e) By all these, if the patient becomes conscious, he should be administered both vamana and virechana therapies to eliminate the poison completely because even small quantity of poison remaining inside produces further stages of poisoning.⁵

२३. लेपः

अङ्ग सहैव दंशेन लेपयेदगदैर्मुहुः । (अ.सं.उ. ४२/११)

- The entire body together with the place of bite should be smeared often with the paste of antipoisonous drugs.
- Lepa is usually recommended following raktamokshana, i.e, the blood left inside after raktamokshana should be stopped from flowing out by cold application of paste.⁶
- Lepa with agadas is recommended following pracchana, a form of raktamokshana.⁷
- Lepa with vata and other sheetala dravyas are recommended following pragharshana, if there is excess of bleeding.⁸

२४. मृतसञ्जीवनः

मृतसञ्जीवनं विषेण मृतस्य अमृत इव संजीवनकर भेषजम् । (चक्रपाणि.चि. २३/५७)

- Just as amruta gives life to a dead, so does mrutasanjeevana in all cases of visha.
- Acharya Charaka has mentioned a formulation named as mritasanjeevana agada which

१. नष्टसंज्ञिविवृताक्षंभग्नग्रीवंविरेचनैः । चूर्णेः प्रधमनैस्तीक्ष्णैर्विषार्तसमुपाचरेत् ॥ (सु.क. ५/४३)
२. ताडयेच्च सिराः क्षिप्रतस्यशाखाललाटजाः । (सु.क. ५/४३)
३. तास्वप्रसिच्यमानासुमूर्ध्निशस्त्रेणशस्त्रवित् । कुर्यात्काकपदाकारं व्रणमेवंस्त्रवन्ति ताः ॥ सरक्तं चर्ममांसं वानिक्षिपेच्चास्यमूर्धनि । चर्मवक्षकषायं व कल्कं वा कुशलोभिषक् ॥ (सु.क. ५/४४-४५)
४. वादयेच्च अगदैर्लिप्त्वा दुन्दुभीस्तस्य पार्श्वयोः । (सु.क. ५/४६)
५. लब्धसंज्ञं पुनश्चैनमूर्ध्वचाधश्च शोधयेत् । निःशेषं निर्हरच्चैवं विषं परमदुर्जयम् ॥ (सु.क. ५/४७)
६. शोणितं स्तुतशेषं च प्रविलीनं विषोष्मणा । व्योपसेकैः सुबहुशः स्तम्भयेद् भृशशीतलैः ॥ (अ.सं.उ. ४२/१७)
७. समन्तादगदैर्दंशं प्रच्छयित्वा प्रलेपयेत् ॥ (सु.क. ५/१६)
८. घर्षणमतिप्रवृत्ते वटादिभिः शीतलैर्लेपः ॥ (च.चि. २३/४१)

can be made into pills.¹ It cures all types of poison. Apart from this it makes a person victorious, revives a person who is apparently dead because of poisoning and cures fever.²

- Apart from the above, if inhaled, applied externally as an ointment, carried in the body as an amulet, smoked or kept in the house, it overpowers the afflictions by evil spirits, poisons, germs, alaksmi or in-auspiciousness, black magic, mantra, fire, thunder bolt and enemies. It counter acts the evil effects of bad dreams and stridosha. It prevents untimely death, fear of water and thieves. It endows a person with wealth, food grains and success in all his undertakings. It promotes auspiciousness, nourishment and longevity. This excellent recipe is called as Mrutasanjeevani agada.³
- Acharya Vagbhata described the combination of visha, sindhuvara and tagara as mrutasanjeevana agada⁴.

Important Questions:

Short Answers:

1. Mantra chikitsa in Visha.
2. Parisheka
3. Mrutasanjeevana agada.
4. Vamana chikitsa in Visha.
5. Virechana in Visha.

Short Essay:

1. Arishta bandhana.
2. Raktamokshana chikitsa in visha.
3. Upadhana chikitsa.
4. Kaakapaada chikitsa.
5. Hridayaavarana
6. Prativisha.
7. Sanjnasthapana in visha.

Long Question:

1. Enumerate the Charakokta Visha Upakramas. Describe any three in detail.
2. Describe in detail the Chaturvimshati Upakramas in Visha Chikitsa as explained in Charaka Samhita.

१. स्पृक्षा प्लव.....गुटिकाविधेयाः स्युः॥ (च.चि. २३/५७)

२. सर्वविषघ्नोजयकृद्विष मृतसंजीवनोज्वरनिहन्ता॥ (च.चि. २३/५८)

३. प्रेय विलेपनधारणधूम ग्रहणैर्गृहस्थश्च ।

भूतविषजनत्वक्ष्मीकर्मजमन्त्राग्न्यशन्यरीनूहन्त्यातदुःस्वप्नस्त्रीदोषानकालभरणाम्बुचौरभयम् । धनधान्यकार्यसिद्धिः श्रीपुष्ट्यायुर्विवर्धनोऽधन्यः॥
मृतसंजीवन एष.....॥ (च.चि. २३/५९-६०)

४.ससिन्दुवारतगरमृतसंजीवनविषम् ॥ (अ.सं.उ. ४८/१४)

Sthavara Visha

VISHA and UPAVISHA

According to Rasatarangini, the Sthavara visha have been classified as the Mahavisha and Upavisha.

Visha / Mahavisha:

हालाहलः कालकूटः शृङ्गकक्ष प्रदीपनः । सौराष्ट्रिको ब्रह्मपुत्रो हारिद्रः सक्तुकस्तथा ।।

वत्सनाभ इति ज्ञेया विषभेदा अमी नव । रसे रसायनादौ च वत्सनाभः प्रशस्यते ।। (र.त. २४/७)

The Mahavisha are 9 in number Haalahala, Kaalakuta, Shringaka, Pradeepana, Sourashtrika, Brahmaputra, Haaridra, Saktuka and Vatsanabha. Vatsanabha is best for rasayana purpose. Among the 9 Mahavisha, only Vatsanabha is identified at present.

VATSANABHA (वत्सनाभ)

Type of Poison: Cardiac Poison

Derivation of the Word वत्सनाभः

वत्सान् नभ्यति हिनस्तीति ।

The name वत्सनाभ is because the root appears like umbilical cord of a new-born calf and one who consumes it will die due to its poisonous effects.

विषवृक्ष विशेषः इत्यमरः

वत्सनाभ is a विष वृक्ष ।

वत्सस्य नाभिरिव वत्सनाभः ।

Botanical Source:

- (a) Aconitum ferox- Indian aconite
- (b) Aconitum napellus- European aconite

Family : Ranunculaceae

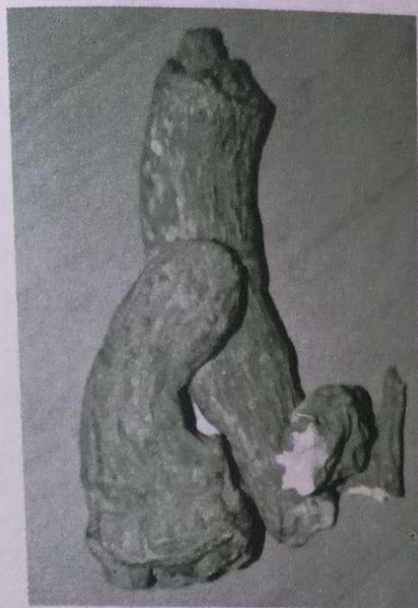
Vernacular Names:

Hindi : Mita vish, Mita zaher, Bish

English : Monk's hood, Wolfs bane, blue rocket.

Synonyms : वत्सनाभ, अमृत, विष, गरल

Toxic part : All parts are poisonous, Mainly root



Habit:

Vatsanabha is a small tuberous-rooted, perennial herb reaching 1.0 metre tall growing in Himalayan region.

ROOT: The dry root is more or less conical with tapering end. Surface presents scars or bases of broken rootlets and is usually arched and shriveled with longitudinal wrinkles. It is about 5-10 cm in length and about 1.25-1.9 cm thick at the upper extremity. It is dark brown externally whitish and starchy internally that turns pink when exposed to air.

Habitat: On the Alpine Himalayas and Alpine Nepal.

Rasa Panchaka:

रस	:	मधुर
गुण	:	रुक्ष, लघु, तीक्ष्ण
वीर्य	:	उष्ण
विपाक	:	कटु

Toxic Chemical constituent: Aconitine, Pseudo aconitine, Aconine, Picroaconitine

Action:

Toxicity of Aconitine and related alkaloids are due to their actions on the voltage sensitive sodium channels of the cell membranes of excitable tissues. Aconitine first stimulates and then paralyzes the peripheral terminations of sensory and secretory nerves, CNS and nerves of the myocardium, skeletal and smooth muscles. It does not affect the higher centers of the brain as consciousness remains intact till the end.

Signs and Symptoms:

System

Signs and Symptoms

GIT

Bitter -sweet taste in the mouth, initially intensive burning and tingling on lips, mouth and throat,

System	Signs and Symptoms
	salivation, dysphagia, nausea, vomiting, pain abdomen, gradually feeling of anesthesia and numbness supervenes in upper GIT.
CVS	Hypotension, chest pain, palpitation, bradycardia, sinus tachycardia, ventricular ectopics and ventricular fibrillation, pulse is slow, feeble and irregular.
CNS	Vertigo, restlessness, headache, giddiness.
MS	Weakness of the muscles of the limbs with twitching and spasms.
RS	Respiration is slow, laboured and shallow.
Ocular	Pupils alternatively contract and dilate. Diplopia and impaired vision occurs.
Others	Temperature is subnormal and skin is cold.

Fatal dose: 1-2 gm of root.

2-5 mg of pure aconitine.

Fatal period: 2-6 hrs.

Treatment:

There is no specific antidote for Aconite and treatment is supportive.

- Gastric lavage with warm water, milk, tannic acid.
- Multiple dose of activated charcoal.
- Atropine- 1/2mg to 1 mg IV, to treat bradycardia.
- Symptomatic treatment.

Post-mortem Appearance:

- Usually unidentified.
- Fragments of root in stomach contents.
- Inflamed mucous membrane of stomach and small intestine.
- Frothy mucous in trachio-bronchial tree.
- Odour of chloroform in stomach.
- Necrosis of the myocardium.

Medico-legal Importance

- It is an ideal-homicidal poison - as it is cheap, easily available, lethal dose is small, fatal period is short, colour can be disguised by mixing it with sweets or by giving it with betel leaves, is extremely unstable and destroyed by putrefaction, hence cannot be detected by chemical analysis.
- Usually accidental poisoning is common as it is mistaken for horseradish, it may be used by quacks for remedies, may be taken mixed with liquor to increase intoxication.
- Sometimes used as abortifacient, cattle poison or arrow poison.

Method of Shodhana:

- वत्सनाभ is cut into small pieces and soaked in गोमूत्र for 3 days. Each day, fresh गोमूत्र is replaced. Later it is washed and dried under sunlight¹.
- वत्सनाभ is cut into small pieces, tied in पोट्टलि and स्वेदन is given for 1 याम using अजदुग्ध²

औषध योग:

मृत्युञ्जय रस
आनन्द भैरवि रस
सञ्जीवनि वटि
त्रिभुवन कीर्ति रस
हिङ्गुलेश्वर रस etc.

Therapeutic Dose:

1/16-1/8 रत्ति³

UPAVISHA

Different authors have explained different number of upavisha. Rasa tarangini has explained 11 upavishas as follows:

विषतिन्दुकबीजं च तु अहिफेनञ्च रेचकम् । धतूरबीजं विजया गुञ्जा भल्लातकाह्वयः ॥

अर्कक्षीरं स्नुहीक्षीरं लाङ्गली करवीरकम् । समाख्यातो गणोऽयं तु बुधैरुपविषाभिधः ॥ (र.त. २४/१६३)

The 11 upavishas include:

Vishatinduka beeja (Kupeelu), Ahiphena, Rechaka (Jayapala), Dhatura beeja, Vijaya (Bhang). Gunja, Bhallataka, Arka Ksheera, Snuhi Ksheera, Langali and Karaveera.

१. शोधनः कृत्वा चणकस्थूलां विषभागान्क्षतु भाजने। तत्र गोमूत्रकं क्षिप्त्वा प्रन्यहं नित्यं नूतनम् ॥ शोषयेत् त्रिदिनात् ऊर्ध्वं धृत्वा तीव्र आतपे ततः। प्रयोगेषु प्रयुञ्जीत भागम् अनेन तद्विषम् ॥ (आ.प्र.)
२. खण्डीकृतो वत्सनाभः पोट्टलीगर्भसंस्थितः। अजादुग्धेन सुस्विन्नो यामतः शुद्धिमाप्नुयात् ॥ (र.त.)
३. कलांशतो रक्तिकाया वस्वशप्रमितं विषम् । विमलं विनियुञ्जीत बलकालाद्यपेक्षया ॥ (र.त. २४/६६)

KUPEELU (कुपीलु) / VISHATINDUKA (विषतिन्दुक)

- **Type of poison :** Spinal poison
- **Botanical Name :** Strychnous Nux vomica
- **Family :** Loganiaceae
- **Vernacular names :**

Hindi → कुचल

English → Poison nut tree, Nux vomica tree, Quaker buttons.

पर्याय/Synonyms:

1. कुपीलु, तिन्दुक, काकतिन्दुक, विष तिन्दुक

Toxic part: Seeds (crushed).



Habit: It is a medium sized tree with dark or grey coloured wood. The leaves are broadly elliptic with prominent veins. Fruits are attractive and are often eaten up by crows and monkeys. The ripened fruit contains seeds which are poisonous. They are flat and circular disc shaped with slight convexity on one side and concavity on the other. The seeds are ash grey in colour with shining surface and short hairs. They are 10 to 30 mm in diameter and upto 6 mm thick, having more or less rounded margin. Internally seed consist of a small embryo with 2 heart shaped cotyledons.

Habitat: Distributed all over India.

Rasa Panchaka:

रस	=	तिक्त, कटु
गुण	=	रुक्ष, लघु, तीक्ष्ण
वीर्य	=	उष्ण
विपाक	=	कटु

Toxic Chemical Constituent:

- Strychnine
- Brucine
- Loganine

- **Signs and Symptoms:**

Onset of symptoms depends on the route of administration. It is immediate when given by injectable route.

- If uncrushed nux vomica seeds are ingested, they are not poisonous as hard pericarp is non-digestible.
- If crushed seeds are taken or the seeds chewed there is an intensely bitter taste in mouth.
 - Symptoms of poison appear within 15-45 min.
 - A choking sensation in the throat which leads to difficulty in swallowing and a sense of suffocation.
 - Stiffness of face, neck and twitching of muscles of various parts of body.
 - Excitation of all portions of nervous system by blocking of post-synaptic uptake by brainstem and spinal cord receptors.
 - When there is no inhibitory effect the motor neurons do not stop their stimulus and the victim will have constant muscle contractions affecting all muscles at a time.
 - The threshold for CNS stimulation is lowered so much so that any sensory stimulus of pain, touch or noise may produce violent muscular spasm.
 - These convulsions are at first clonic (intermittent) and then tonic (sustained) in nature.
 - The chest is fixed so that breathing is difficult and thus cyanosis is noticed.
 - During the convulsions, the face becomes cyanosed and wears an anxious look of impending death.
 - The eyes are staring, eyeballs prominent and pupils dilated. The angles of the mouth and eyes are drawn backwards and the mouth covered with froth which may be blood stained also.
 - **Risus sardonicus/Scornful laughter/dog like laughter or grinning:** It results from raising of patient's eyebrows, bulging of eyes and contraction of the jaw and facial muscles in which the corners of the mouth are drawn back leading to an evil looking grin.
 - The body may take one of the shapes due to contraction of muscles.

- (a) Opisthotonus = Body arched backward on heels and head.
- (b) Emprosthotonus = Body arched forwards and resting on knee and fore head.
- (c) Pleurosthotonous = Body arched laterally/sideways.
- Duration of the convulsions is about half to 2 minutes after which the convulsion passes off and all muscles are relaxed completely.
- During convulsions, the patient remains awake and aware of everything around him, since strychnine does not cross the blood brain barrier.
- The patient might look normal though exhausted and this is only temporary.
- As the poisoning progresses, spasms increase in severity, duration and frequency. Any slight impulse like movement or sound or even a flash of light or current of air will elicit a spasm.
- Vomiting is readily induced and remains till death.
- Death usually occurs either during spasm or is due to asphyxia from spasm of respiratory muscles or medullary paralysis or exhaustion from convulsions.

Diagnosis:

Poisoning has to be differentiated from tetanus. The chief differentiating points between strychnine poisoning and tetanus are as follows.

Strychnine	Tetanus
1. History of poisoning	History of Injury
2. Sudden onset	Gradual onset
3. All muscles are affected at a time (generalized convulsions)	The muscles of neck and lower jaw are affected first (lock jaw)
4. Chest fixed during convulsions	Not so in tetanus
5. During the intervals the muscles are relaxed completely	Relaxation is never complete and muscles still remain rigid.
6. Death occurs within few hours	Death rare within few hours.
7. Chemical analysis reveals the poison.	Not so.

- **Fatal dose:** → 1-2 crushed seeds.
→ 15-30mg of strychnine
- **Fatal period:** → 1-2 hours

Treatment:

- Treatment involves supportive care with minimization of external stimulus and prevention of convulsions.

- Maintain clear airway and adequate ventilation including endotracheal intubation.
- Control of convulsions: The patient should be kept in bed in a dark quiet room, free from noise and disturbance.
- Short acting barbiturates like pentobarbital sodium, sodium amytal and other barbituric acid derivatives are considered as valuable antidotes. These should be administered immediately intra-venously in a dose of 300-600 mg.
- Diazepam 0.1-0.5mg/kg IV slowly and short acting muscle- relaxants are administered.
- Stomach wash with dilute solution of KMnO_4 (Potassium permanganate) is given when there is no convulsion.
- Artificial respiration is given when necessary, when spasms are controlled.
- Suspension of animal charcoal is introduced to adsorb any free strychnine.

Postmortem Appearances:

- Similar to those of asphyxia.
- Rigor mortis sets in almost immediately after death and passes off early.
- The remains of seed may be found in stomach. It resists putrefaction.
- The mucous membrane of duodenum and stomach occasionally shows congestion.
- Lungs are congested. Brain and its membrane, upper part of spinal cord are found congested.

Medico-legal Importance:

- Poisoning is mostly accidental like from an overdose of a medicine or when children eat the seeds out of curiosity.
- Homicide is rare on account of its intensely bitter taste.
- Suicide with strychnine is also rare for death is incredibly painful.
- Nux vomica seeds are used in cattle poisoning, to kill stray dogs and sometimes as arrow poison.

Method of Shodhana:

1. कुपीलु seeds are taken in a cloth and bundled into पोट्टली form. स्वेदन by using ढोलायन्त्र is given containing गोदुग्ध for 1 याम^१.

१. विषतिन्दुकबीजानि पोड्डल्यां विन्यसेद्भिषक् । स्वेदयेद् गव्यपयसः दालिकायन्त्रमार्गतः ॥
एवं यामैकमात्रेण शुद्धिमायान्त्यनुत्तमाम् । शोधितं तिन्दुकं त्वेत्रं वीतशङ्कं प्रयोजयेत् ॥ (र.त. २४/१७६)

2. आज्य भर्जन: कुपिलु seeds are fried in ghee¹.
3. काञ्जिका स्थापना → कुपीलु seed are soaked in काञ्जिका for 3 days².
4. According to रसामृता परिशिष्ट : कुपीलु seeds are kept in गोमूत्र for 7 days, गोमूत्र should be replaced by fresh one daily. After 7 days the seeds are washed with water and tied in पोडुली subjected for ढोलायन्त्र स्वेदन containing गोदुग्ध for 3 hours. Discard the testa and embryo, the cotyledon part is roasted in घृत, powdered well and used.

औषध योगः

लक्ष्मीविलास रस

विषतिन्दुक वटी

अग्रितुण्डी रस etc.

Therapeutic dose: 1/4-1 गुञ्जा (125mg)³

AHIPHENA (अहिफेन)

- **Type of Poison** : Somniferous/Narcotic Poison
- **Botanical name** : Papaver somniferum Linn.
- **Family** : Papaveraceae.
- **Vermacular names** :
 - English : Opium, Poppy
 - Hindi : Aphim
- **Synonyms** - खसफलाक्षीर, आफूकम्, अहिफेनम्, तिलभेद, खसतिल, खाखस

The term somniferous means "sleep producing". This group include those which are derived from opium ie., opiates and those which have a similar action but are not derived from opium, ie, opioids. Opium is the latex obtained by incising the fruit capsule of Papaver somniferum, growing upto 1mt height. Since poppy is highly addictive, there are strict restrictions regarding the cultivation of the poppy plant in India. It can only be grown for therapeutic purposes and permission must be sought from the government for its cultivation and subsequent sale of the extract to pharmaceutical companies. The plant is widely cultivated in the state of Rajasthan, Uttar Pradesh and Madhya Pradesh in India.

१. कारस्करस्य बीजानि त्वनिमन्दाग्नियोगतः । निधाय पिष्टपचने तावदाज्येन भर्जयेत् ॥
यावद् बहिस्त्वचा किञ्चिज्जायते कपिशप्रभा । कुचेलमेवं त्वरितं शुद्धिमायात्यनुत्तमाम् ॥ (र.त. २४/१७६)
२. विषतिन्दुकबीजानि विन्यसेद् गृहवारिणि । दिनत्रयं प्रयत्नेन त्वपनाय बहिम्त्वचम् ॥ (र.त. २४/१७६)
३. आरभ्य गुञ्जापादांशाद् गुञ्जैकप्रमितं परम् । मात्राविद्विनियुञ्जीत विमलं विषतिन्दुकम् ॥ (र.त. २४/२०३)

Forms of अहिफेन:

(1) Opium or Afim

It is the coagulated air dried latex juice obtained by the incision of the unripe capsules of white poppy (*Papaver somniferum*).

(2) Poppy Capsules

Capsules of opium when they are ripe and dried, used for narcotic and sedative action.

(3) Poppy Seeds

Also called as khas-khas, are innocuous and white in colour. Used as constituent in some food.

(4) Poppy Seed Oil

Used for culinary and lightning purpose.

Toxic part : फल निर्यास/Latex.



Habit:

An erect rarely branched annual herb growing upto 60-120 cm height.

Leaves : Oblong, lobed, lobes are dentate or serrate.

Flowers : Large, white, sometimes purple or scarlet.

Fruit : Capsule, stalked one inch diameter, globose glabrous; each plant bears 5-8 capsules.

Seeds : White or black in colour, small.

Habitat:

Largely cultivated as a cold weather crop, chiefly in the eastern parts of the country.

Rasa Panchaka:

रस	:	तिक्त-कषाय
गुण	:	सूक्ष्म, रूक्ष, व्यवायी
वीर्य	:	उष्ण
विपाक	:	कटु
प्रभाव	:	मादक

Toxic Chemical Constituent:

- Chemical constituents:

2 groups of alkaloids:

(1) Phenanthrene Derivatives:

- Natural alkaloids:

- Morphine (10%)
- Codeine (0.5%)
- Thebaine (0.3%)

- Semi synthetic opioids: They are produced by chemical modification of an opiate.

- Hydromorphone.
- Diacetylmorphine (heroin, brown sugar or smack)
- Oxymorphone
- Oxycodone.

- Synthetic opioids: These compounds are not derived from an opiate, but binds to an opioid receptor and produce opioid effects clinically.

- Methadone
- Fentanyl
- Pentazocine.
- Tramadol
- Meperidine/Pethidine.

(2) Benzyl isoquinolone Derivatives :

- Papaverine(1%)
- Narcotine(6%).

Mode of Administration

- Applied on abraded surface of a wound.

- Injection-intravenously (mainlining) or subcutaneously (skin popping).
- It can be introduced into rectum or vagina.
- It can also be taken by snorting or smoking.
- It may be mixed with cocaine known as speed balling and taken orally.

Signs and Symptoms:

- The classic triad of opiate poisoning is respiratory depression, pin pointed pupils and impairment of sensorium.
- The signs and symptoms are categorized into:

- (1) Acute poisoning
- (2) Chronic poisoning

(1) Acute Poisoning

- Usually commence within 1/2 an hour to an hour after the intake of poison.
- The symptoms manifest themselves in 3 stages namely:

- (a) Stage of excitement
- (b) Stage of stupor
- (c) Stage of narcosis

(a) Stage of Excitement or Euphoria

During this stage the symptoms are

- Increased sensation of wellbeing.
- Increased mental activity, talkativeness and laughter.
- Freedom from anxiety.
- Restlessness
- Hallucination
- Flushing of face
- Excited or maniacal condition.

This stage is of short duration or may be absent if a large dose is taken.

(b) Stage of Stupor

- Headache
- Nausea
- Vomiting
- Giddiness
- Lethargic condition

- Drowsiness
- Uncontrolled desire to sleep from which the patient may be roused by external stimuli first but soon passes into coma.
- Pupils are contracted.
- Face and lips are cyanosed
- Itching sensation is felt all over the skin.
- Pulse and respiration remains normal.

(c) Stage of Narcosis/Coma:

- Patient passes into deep coma, from which he can't be roused.
- There is a marked insensibility to pain.
- Muscles are relaxed and reflexes are lost.
- All secretions are completely suspended.
- Face is pale.
- Lips are livid and lower jaw drops.
- Pupils are contracted to pin points and are insensible to light.
- Increased perspiration.
- B.P. begins to fall and pulse is slow.
- Respiration is slow and laboured and the rate may be 2-4/minute.
- At this stage recovery may take place only by proper treatment or otherwise the respiratory center will become insensitive and paves for respiratory failure.
- Death occurs from asphyxia.

Treatment

- Stomach wash-thoroughly and frequently with a solution of 1:5000 potassium permanganate, leaving some solution in the stomach for oxidizing the alkaloid. Gastric lavage should be carried out even after hypodermic injection of the drug as the alkaloid is re-excreted into the stomach after absorption.
- A table spoon full suspension of charcoal may be introduced to stomach.
- Bowels should be cleared by administering 30 gm of sodium sulphate in large amount of water, to prevent reabsorption.
- Bladder should be emptied by catheterization.
- Administration of oxygen at an increased tension is necessary if cyanosis is present.
- Artificial respiration, if respiration is markedly down.

- Antidote : Nalorphine hydrobromide or naloxone hydrochloride are drugs of choice.

Fatal Dose

Opium:	-	2 gm
Morphine	-	0.2 gm
Codeine	-	0.5 gm
Pethidine	-	2 gm

Fatal Period

6-12 hours

(2) Chronic Poisoning: Morphinism, Morphinomania:

The signs and symptoms are:

Tolerance is seen, i.e., on subsequent occasions the dose has to be increased to get the same effect as before; then these symptoms are seen:

- Dermal scars resulting from repeated injections
- Constricted pupils
- Anorexia
- Loss of memory, mental fatigue, intellectual and moral deterioration.
- Constipation
- Emaciation, weakness, impotence

Treatment:

- Gradual withdrawal of the drug.
- Methadone- 30-40mg daily to be tapered off gradually.
- Propranolol 80mg relieves anxiety.
- Psychiatric counseling.

Postmortem Appearance:

- They are not characteristic, but signs of asphyxia are prominent.
- Face and nails are cyanosed.
- Froth is seen at mouth and nostril.
- Postmortem staining is well marked and cyanotic.
- Smell of opium is noticed on opening chest.
- Stomach may contain small lumps of opium.
- Lungs are oedematous and congested.

- Blood-dark and fluid.

Heroin / Brown Sugar:

Heroin is made from the resin of poppy plants. Pure heroin (diacetylmorphine) is a white powder with a bitter taste abused for its euphoric effects. It is derived from morphine alkaloid found in opium poppy plant. It is most often injected intravenously, however it may also be vaporized, sniffed, used as a suppository or ingested orally.

Brown sugar is a semisynthetic opioid derived from the morphine extracted from poppy plant. Brown sugar accounts for much of heroin use in India, being one of India's most popular drug of addiction.

Method of Shodhana:

अहिफेन is mixed or dissolved in water. It is then strained on cloth. This अहिफेन is taken and bhavana is given for 21 times with आर्द्रक स्वरस. Then it is used as medicine¹.

Therapeutic dose: $\frac{1}{4}$ -१ रत्ति (Ratti)

औषध योग:

अहिफेनासव, निद्रोदयवटि, जातिफलादि वटि, महावातराज रस

JAYAPALA (जयपाल/रेचक)

Type of poison	-	Irritant poison
Botanical name	-	Croton tiglium
Family	-	Euphorbiaceae
Vernacular names:		
Hindi	-	Jamalgota
English	-	Purging croton
Synonyms	-	जेपाल, तिलिडीफल, दन्तीबीज
Poisonous part:	-	Seeds



१. निर्मलं त्वहिफेनं तु शृठवेरस्य वारिणा। विभातितं सप्तवारं शुद्धिमायात्यनुत्तमाम् ॥ (र.त. २४/२४२)
 २. आरभ्य गुञ्जापादांशाद् गुञ्जैकप्रमितं शुभम्। अहिफेनं प्रयुञ्जीत बलकालाद्यपेक्षया ॥ (र.त. २४/२६२)

Habit- A tropical evergreen tree, seen all over India and growing upto 15-20 ft.

Flowers	-	Greenish yellow coloured
Bark	-	Smooth, ash coloured
Leaves	-	Alternate and toothed with a terminal raceme inflorescena.
Seeds	-	Seeds albuminous, ovate, oblong, convex on dorsal and some what flattened on ventral surface and resemble castor seed in shape, dull cinnemon-brown, often mottled with black due to abrasion. Kernel yellowish and oily, consisting of large endosperm, no marked odour.
Oil	-	is brownish in colour, viscid in appearance, unpleasant in smell and bitter in taste.

Habitat - All over India.

Rasa Panchaka:

रस	→	कटु
गुण	→	गुरु, रुक्ष, तीक्ष्ण
वीर्य	→	उष्ण
विपाक	→	कटु

Toxic Chemical Constituent:

Seeds	-	Crotin (toxalbumin)
	-	Crotonoside
Oil	-	Crotonoleic acid.
	-	Methyl crotonic acid
	-	Crotonol

Signs and Symptoms:

- Hot burning pain in mouth and throat extending to the abdomen.
- Salivation
- Nausea
- Vomiting
- Purging with severe griping pain and bloody stools
- Tachycardia
- Vertigo
- Circulatory and respiratory collapse and death.

Fatal dose - 1-4 seeds (Crushed)

Fatal period – Average 4-6 hrs.
Greater than 3 days also reported.

Treatment:

- 1) Stomach wash with water and activated charcoal.
- 2) Maintenance of fluid and electrolyte balance.
- 3) Demulcent drinks like milk/egg white.
- 4) Morphine to allay pain.

Post Mortem Appearances:

- Red inflamed mucus membrane of stomach and intestine-excoriated at places.
- Congested liver and spleen.
- Swollen and congested kidney.
- Occasionally postmortem finding are negative.

Medico-legal Importance:

1. Accidental poisoning resulting from swallowing croton oil by mistake/when taken in large doses as a purgative or by eating seeds/inhaling their dust.
2. Suicidal and homicidal are rare.
3. The root and oil are sometimes taken internally as an abortifacient.
4. Oil is used as arrow poison.

Method of Shodhana:

Fresh जयपाल बीज is taken. Remove its बाह्यत्वच and radicle after cutting it as two.

↓

पोट्टली is prepared using the बीज and place it in ढोलायन्त्र

↓

स्वेदन is done for 1 प्रहर using गोदुग्ध. This procedure should be repeated for 3 times¹.

औषध योग:

- | | |
|-----------------|----------------|
| १. जयपालाञ्जन | ३. जलोदरारि रस |
| २. इच्छाभेदि रस | |

Therapeutical Dose:

1/8 - 1/4 गुञ्जा^१ (gunja)

१. जयपालस्य बीजानि नवानि तु समाहरेत् । बाह्यत्वचमपाकृत्य द्विधा खलु विभेदयेत् ॥ हरिद्रवर्णा नातिदीर्घा रसनां तु परित्यजेत् । पोट्टलामय विन्यस्य ढोलायन्त्रे विधानतः ॥ गव्यदुग्धे प्रयत्नेन यामैकं स्वेदयेत्ततः । एवं त्रिवारं सुस्विन्नो जयपालो विशुद्ध्ययानि ॥ (र.त. २४/३१०)
२. अष्टमांशाद्रक्तिकाया रक्तचरणांशिकम् । जयपालं प्रयुञ्जीत भेषजैः सह योजितम् ॥ (र.त. २४/३२०)

DHATTURA (धत्तूर)

Type of poison : Deliriant poison
 Botanical name. : Datura metal Linn.
 Family. : Solanaceae

Vernacular Names:

Hindi → Dhatura
 English → Thorn apple, Devils trumpet.

Synonyms:

१. धत्तूर	३. उन्मत्त	५. मदन
२. किनव	४. कनक	६. शिवप्रिया

Toxic part : Seed



Habit: Small shrub growing 4-5 feet high.

- Leaves
 - 6-8 inch long.
 - Large and angular, uneven at the base, wavy and warsely toothed margin with strong veins.
- Flowers
 - Trumpet shaped.
 - Upto 9 cm long.
 - Have a long tubular calyx. Corolla is funnel shaped and white or purplish brown in colour.
- Fruit
 - Globular
 - Fruit capsule has spine and contains upto, 500 reniform seeds.
- Seeds
 - Bitter in taste
 - Ear/kidney shaped, 1-6 mm long
 - Resembles those of capsicum seeds

Habitat: Common in tropic parts of India and temperate part of Himalaya.

Rasa Panchaka:

रस	→	तिक्त, कटु
गुण	→	लघु, रूक्ष
वीर्य	→	उष्ण
विपाक	→	कटु
कर्म	→	कफवातहर, विषघ्न, कासहर

Toxic Chemical Constituent:

1. Hyoscine (scopolamine).
2. Hyoscyamine.
3. Atropine.

Signs and Symptoms:

(a) **General Signs and Symptoms:**

- Nausea and vomiting
- Bitter taste, dryness in mouth and throat
- Difficulty in swallowing
- Burning sensation in stomach
- Headache, difficulty in talking
- Giddiness, staggering gait
- Incoordination of muscles
- Flushing of face
- Dry hot skin and rise in temperature
- Photophobia
- Dilated pupils, loss of near vision
- Red and congested conjunctiva
- Urinary retention
- Drowsiness
- Scarlatiniiform rash/exfoliation of skin
- Initially slow respiration, subsequently the rate increases.
- Weak, slow, irregular and collapsing pulse
- Death due to respiratory failure and cardiac failure.

(b) **Main Symptoms (9 Ds)**

- (1) Dryness of mouth and throat
- (2) Dysarthria (difficulty in talking)
- (3) Dilatation of cutaneous vessels.

- (4) Dysphagia.
- (5) Dilatation of pupil (Mydriasis-dilated pupil unresponsive to light)
- (6) Dry hot skin.
- (7) Drunken gait
- (8) Delirium
- (9) Drowsiness

(c) **Signs and Symptoms Summarized in Classical Phrase.**

S.No.	Classical Phrase	Reason
(1)	Blind as bat	The pupils are dilated, insensitive to light, and the power of accommodation for near vision is paralyzed, developing into temporary blindness.
(2)	Hot as hare	The body temperature is raised by 1-2°C due to inhibition of sweat and stimulation of heat regulating center. The skin is dry and hot.
(3)	Dry as bone	Due to inhibition of saliva there is dryness in the mouth and throat.
(4)	Red as beet	The face is flushed due to dilation of cutaneous blood vessel.
(5)	Mad as wet hen	Mind is affected early. The patient is at first restless and confused, exhibits typical pillrolling movements, later becomes delirious and mutters indistinct words. Visual and auditory hallucinations may be present.

Fatal dose : 50-100 seeds

Fatal period : 24 hrs

Treatment:

1. Decontamination with emesis or stomach wash with weak solution of tannic acid.
2. Activated charcoal given with cathartic.
3. Wash out the lower bowel frequently.
4. Antidotes used are :
 - (a) Physostigmine - 1-4 mg IV / IM at hourly intervals.
 - (b) Pilocarpine - 5-15 mg subcutaneously.
- 5) Diazepam IV for sedation and seizures. Morphine is to be avoided.

6) Supportive measures

Postmortem Appearances:

- Fragments of seeds may be found in stomach and intestines.
- Internal organs are mostly congested.
- Rarely mucus membrane of stomach is inflamed.

Medico-legal Importance:

- (1) Usually used as a stupefying poison given to travelers in highway robbery and kidnapping, hence is known as **rail-road poison**.
- (2) Suicidal poisoning is rare
- (3) Accidental poison is common due to its use by quacks in medicine or by mistaking them for edible fruits/capsicum seeds.

Datura seeds and capsicum seeds are similar to each other and have chance to adulterate.

Difference Between Capsicum and Datura Seeds:

	Criteria	Datura	Capsicum
1.	Size	Large and thick	Small and thin
2.	Shape	Kidneyshape	Round
3.	Surface	Tiny depressions	Smooth
4.	Odour	Odourless	Pungent
5.	Taste	Slightly bitter	Pungent

Method of Shodhana:

- स्वेदन in ढोलायन्त्र using गोदुग्ध for 3 hrs¹.
- Later should do प्रक्षालन or washed with hot water. Dry it and can be stored.

औषध योगः

१. उन्मादगजांकुश रस
२. कनकासव
३. प्रलापान्तक रस
४. धतूर तैल
५. महाकनक तैल

Therapeutic Dose:

बीज चूर्ण = $\frac{1}{4}$ - $\frac{1}{2}$ गुञ्जा

पत्र चूर्ण = $\frac{1}{2}$ to $1\frac{1}{2}$ गुञ्जा^३

१. धतूरबीजान्यादाय पोट्टल्यां रोधयेत्ततः। स्वेदयेद्दोलिकायन्त्रो गव्यदुग्धेन यामकम् ॥
संस्वेद्य क्षालयेदुष्णतोयेन तु ततो भिषक्। इत्थं शुद्धानि बीजानि वीतशङ्कः प्रयोजयेत् ॥
२. आरभ्य गुञ्जापादांशाद् गुञ्जार्धं तु विशोधितम्। धतूरबीजचूर्णेन्तु प्रयुञ्जीत विधानवित् ॥
गुञ्जार्द्धतः समारभ्य सार्द्धगुञ्जैकसंमितम्। चूर्णं धतूरपत्राणां प्रणाचार्यः प्रयोजयेत् ॥ (र.त. २४/३६८)

BHANGA (विजया/ भाङ्ग)

Type of poison	:	Deliriant poison
Botanical name	:	Cannabis sativa/indica.
Family	:	Cannabinaceae
Varnacular Names:		
English	:	Indian hemp
Hindi	:	भङ्गा/ Bhang

Synonyms :

भाङ्ग, बुटी, भंगा, मादिनी, सिद्धि

Toxic part: All parts of the plant except stem, root and seeds of cannabis.

**Habit:**

It is a tall annual herb, often found in hilly areas and farm grounds naturally and is also cultivated these days. Plant grows upto 1-1½ m, Leaves are dorsiventral and light green in lower surface, upper surface is dark green. Flowers are light yellow to green in colour.

Habitat:

Grows all over India. Any how NDPS Act bans the production and sale of cannabis resin and flowers, but permits the use of the leaves and seeds.

Rasa Panchaka:

रस	-	तिक्त
गुण	-	लघु; तीक्ष्ण, व्यवायी
वीर्य	-	उष्ण
विपाक	-	कटु

Forms of Bhang:

It is the most widely used illicit drug in the world. It is used in the following forms:

१. भाङ्गः Bhang:

- The dried leaves and fruit shoots are used to prepare an infusion or decoction.
- The dried leaves and fruit shoots are mixed with sugar and black pepper and consumed in paste form.
- It is the mildest form of cannabis and contains about 15% of active principle. Fresh bhang is highly intoxicating whereas the bhang kept in store for 2-3 years is mildly stimulating and pleasure giving.

Effects:

- Causes mild intoxication which makes a person sing and dance, to eat food with more relish and to seek sexual enjoyment.
- Intoxication lasts for 3-4 hrs.

२. माजुनः Majun:

Sort of confectionary prepared of bhang done after heating it with flour, sugar, milk and butter milk.

Effects: Feeling of great appetite and sexual desire. Feels happy and excited. Sometimes dhatura is mixed with majun.

३. गाङ्गाः Ganja:

- Is prepared from flower tops of female plant. It has a rusty green colour and characteristic odour. It is mixed and smoked with tobacco in a pipe or hukka.
- It contains 15-25% of active principle.
- Ganja is also known as marijuana is used for smoking in cigarettes which contains 0.3-0.6g of cannabis and known as reefers or joint.

Effects: Feeling heavy and lazy, conjunctival suffusion, tachycardia, hypotension etc.

४. चरस/हशिश : Charas or Hashish:

- It is dark green brown colour and its commonly called as हशिश. It is concentrated resin exuding from leaves and stems of the plant. It contains 25%-40% of active principle.
- Smoked with tobacco in pipe/hukka. It is the most potent form of cannabis.

Toxic Chemical Constituent: Tetrahydrocannabinol. (THC)

Action:

THC binds to the anandamide receptors in the brain and may have stimulant, sedative or hallucinogenic actions depending on the dose and time after consumption.

Signs and Symptoms:

A. Psychiatric:

- In small dose, effects are somewhat similar to those of alcohol causing euphoria at first followed by narcosis. The patient is pleased with himself, has a feeling of cheerfulness and well-being and tends to be talkative, relaxed, dreamy, laughing always and rapidly changing emotions.
- Thought process: irrelevant thoughts, decreased concentration and attention span, altered sense of identity, disorientation.
- In a susceptible person or with a larger dose, there is loss of perception of time and space.
- He is the subject of visual hallucinations.
- This stage is followed by one of narcosis characterized by giddiness, confusion and ataxia. Commonly there is tingling and numbness of the extremities or in severe cases generalized anaesthesia.
- Distortion of perception - during the so called "TRIP" the person feels that he can fly from high windows or stop passing buses with bare hands.
- The victim may pass into deep sleep for about 6 hours and wake up recovered. Rarely drowsiness may be followed by coma and collapse and death may occur from respiratory paralysis.

B. Physical:

- Increased appetite and thirst, slight nausea, heaviness, pressure in head, dizziness, somnolence, paraesthesias, restlessness, ataxia, tremors, dry mouth, tachycardia, urinary frequency.
- The victim becomes drowsy and passes into deep sleep and wakes with exhaustion and impaired mental function. Recovery occurs in about six hours. Death occurs with extreme rarity due to respiratory failure.

Chronic Poisoning:

- Excess consumption of cannabis or consumption of the same for a long time, leads to chronic poisoning.
- Tolerance and psychological dependence develops.
- Degeneration of the CNS and insanity.
- Reduction in the serum testosterone and sperm count, may be associated with gynaecomastia.
- Gradual loss of appetite, weakness, wasting, tremors, sleepy facial expression, vacant

look, red eyes, impotence, moral and mental deterioration.

- Rarely they become insane- Hashish insanity, may suffer from visual and auditory hallucination and delusion.
- Patient may RUN AMOK: A psychic depression marked by a period of depression, followed by violent attempts to kill people. He first kills a person with whom he may have real or imaginary enmity, but then kills anyone who comes in his way until the homicidal tendency lasts. Then he may commit suicide or surrender himself.
- Criminal responsibility - In RUN AMOK- the person is not held responsible for his act since it is considered as a disease of the mind and not intoxication.

Fatal Dose : चरस् - 2gm / kg body wt.

गञ्जा - 8gm / kg body wt.

भाङ्ग - 10gm / kg body wt.

Tetrahydrocannabinol. (THC) - 30 mg / kg body wt.

Fatal period: Several days.

Treatment:

- This is on the same lines as other narcotics.
- Washing out the stomach with warm water.
- Strong tea/ coffee.
- Hypodermic injection of strychnine.
- Artificial respiration.
- If necessary saline purgatives may be helpful.
- Diazepam, 5-10mg, if patient is violent and aggressive.

Post-mortem Appearances:

- These are not characteristic, but are those of asphyxia.

Medico-legal Importance:

- Most cases of cannabis poisoning are accidental or due to overindulgence.
- It is usually mixed with chocolates and sold.
- Majum and charas are used as stupefying poison prior to robbery, kidnapping etc.
- Sometimes it is taken by criminals before committing a criminal act to strengthen nerves.

Method of Shodhana:

The dried leaves of cannabis are soaked in water and dried. Then it is fried with ghee in

mild fire or mandagni. The bhang obtained after this is shuddha¹.

Another method says भाङ्ग are taken and boiled in बबूलत्वक् क्वाथ for अर्ध घटिका (12 min) and leaves are taken out and dried. Then भावन with गोदुग्ध is given and dried. Now it is शोधित विजया.

औषध योगः

मदनोदय मोदक, त्रैलोक्यविजया वटि, जातिफलादि चूर्ण, त्रैलोक्यसम्मोहन रस।

Therapeutic dose:

२-४ रत्ति^२

GUNJA (गुञ्जा)

Type of poison : Organic irritant-poison.

Botanical name : Abrus precatorius

Family : Fabaceae

Varnacular Names:

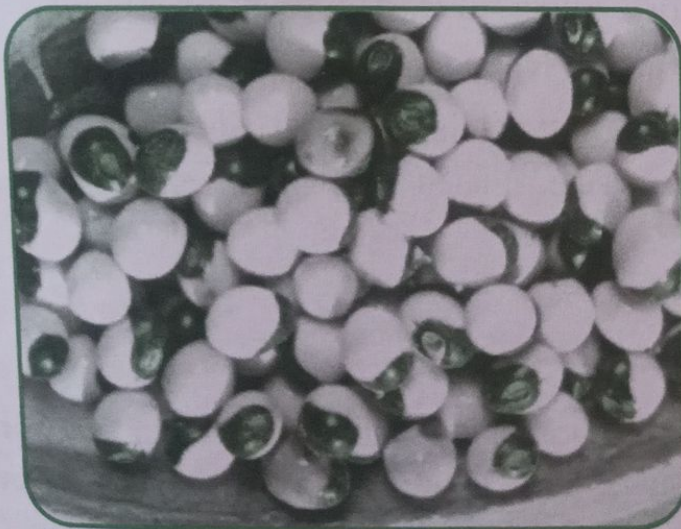
Hindi : Gunja

English : Indian liquorice, jequirity, rosary bead, ratti.

Synonyms :

रक्तिका, रक्ता, ताम्रिका, शीतपाकी

Toxic part : Seed.



Habit:

- A deciduous, slender, twining, climber, with slender flexible branches, stem attaining 4-5 m height.

१. मातुलानी शुष्कपत्रां सलिले तु निमज्जयेत् । निष्पीड्य शुक्लं गव्याज्ये भर्जयेन्मंदवह्निना ॥
सुभृष्टामघ विज्ञाय सत्वरं तु समाहरेत् । इत्थं विशोधितां भङ्गा सर्वत्र विनियोजयेत् ॥ (र.त. २४/३१४-१५)

२. द्विगुञ्जतः समारभ्य चतुर्गुञ्जमितां परम् । भगां खलु प्रयुञ्जीत बलकालाद्यपेक्षया ॥ (र.त. २४/४१४)

- Leaves— Compound, feather like with 10-15 pairs of narrow leaflets, 1-2.5 cm long.
- Flowers— Long, pink, purple, yellowish or whitish, clustered.
- Seeds— 3-6 ovoid, 7.5 cm long, scarlet with a black spot at the hilum, polished, average weight 120-125 mg, present in a seed pod.

Habitat:

It is found all over India.

Rasa Panchaka:

रस	-	तिक्त, कषाय
गुण	-	लघु, तीक्ष्ण, रूक्ष
वीर्य	-	उष्ण
विपाक	-	कटु

Toxic Chemical constituent: Abrin, Abrine, Abralin.

Signs and Symptoms:

Internal Administration:

- When the seeds are swallowed raw or after cooking they are not poisonous. Seeds must be crushed or chewed for harmful effects to occur.
- Symptoms may be delayed from a few hours to 2-3 days when given orally.
- They include severe irritation of upper GIT, abdominal pain, nausea, vomiting, bloody diarrhea, weakness, cold perspiration, trembling of the hands, weak rapid pulse and rectal bleeding, tachycardia, headache, dilated pupils, hallucinations, drowsiness, tetany and circulatory collapse.

External Application:

Method of Preparation of Suis:

- The seeds alone, or mixed with dhatura, opium and onion are worked with a small quantity of spirit into a paste, which is made into spikes or "suis", and then hardened in the sun. These sharp pointed spikes which weigh, on an overage, 90-120 mg, are then placed in a wooden handle, and thrust with great force into the skin of the animal intended to be killed. For homicidal purposes the spike is kept between two fingers and is pushed into the skin while slapping a person.
- The symptoms resembles those of viper snake bite.
- When extract of seeds is injected under skin of the animal it results in a local lesion,

characterized by oedema, necrosis and oozing of haemorrhagic fluid from the puncture site. The animal becomes apathetic and drowsy. It is disinclined to take food. In three or four days, it is unable to move, drops down, become comatose and dies. Convulsion may precede death.

- Human poisoning is characterized by a local painful swelling and ecchymosis, followed by necrosis.

Fatal dose: 90-120 mg by injection
1-2 crushed seeds by mouth

Fatal period: 3-5 days

Treatment: (1) Gastric lavage
(2) Activated charcoal
(3) Purgative
(4) Dissecting out the sui and injection of antiabrin.

Postmortem Appearance:

- The injured site is swollen, inflamed and necrosed. Fragments of sui are usually found in wound. Internal organs are congested and haemorrhagic.
- Mucous membrane of the stomach and intestine is highly congested with numerous haemorrhagic patches on its surface.

Medicolegal Importance:

- Most of the case are accidental like consumption of attractive seeds by children.
- Suis are used to kill cattle either to produce cheap hides or for revenge.
- For homicide, the needle is kept between fingers and giving a slap which drives the needle into the body.
- The use of abrus as an arrow poison is known.
- Malingersers use the powdered seeds to produce conjunctivitis.

Method of Shodhana:

Gunja seeds are tied in a पोट्टली to do ढोलायन्त्र स्वेदन with काञ्जिका as liquid media for three hours. The external cover is removed, washed with warm water, dried well and used¹.

औषध योग: गुञ्जाघृतैल, गुञ्जाजीवनरस, गुञ्जाभद्र रस

Therapeutic dose: बीज चूर्ण- $\frac{1}{2}$ - $1\frac{1}{2}$ रत्ति²

१. गुञ्जाबीजं पोडलीस्यं ढोलायन्त्रे सकाञ्जिकम्। यामैकं स्वेदनादेव शुद्धिमायात्यनत्तमाम्॥ (र.त. २४/४४५)

२. गुञ्जाद्वैतः साद्वगुञ्जैकसंमितम्। गुञ्जाबीजं सुविमलं प्रयुञ्जीत विधानवित्॥ (र.त. २४/४५३)

BHALLATAKA (भल्लातक)

Type of poison	:	Organic Irritant Poison
Botanical name	:	Semecarpus anacardium
Family	:	Anacardiaceae

Vernacular Names:

English	:	Marking nut as its juice is used by dhobhi to mark on clothes.
Hindi	:	भिलव

Synonyms: अग्निमुखी, अरुचकरः, भल्ली, रझकः, वीरवक्षः etc.

Toxic part: Seeds.



Habit:

- Moderate sized, deciduous tree, closely related to the cashew exuding a dark juice.
- Leaves are oblong, thick and big rounded at apex.
- Flowers- Raceme inflorescence
- Fruits- Drupe/nut; purplish black when ripe, cone shaped
- Seeds- Marking nuts or the fruits of भल्लातक are black, cordate shaped, with rough projection at the base. They have a thick, cellular pericarp, which contains an irritant juice which is brownish, oily and acrid but turns black on exposure to air.

Habitat: Distributed in sub-Himalayan region, Tropical region and central part of India.

Rasa Panchaka:

रस	-	कटु, तिक्त, कषाय
गुण	-	लघु, स्निग्ध, तीक्ष्ण
वीर्य	-	उष्ण
विपाक	-	मधुर

Toxic Chemical constituent:

- Semicarpol
- Bhilawanol

Signs and Symptoms of Poisoning:

External Application:

- When the juice is applied to the skin, it causes irritation and painful blisters containing acrid serum which causes an eczema-tous eruption on any part of the skin with which it comes into contact.
- The lesions caused by this resembles a bruise which may later ulcerate and slough.

Internal Administration:

- When the juice is internally administered, it is much less irritant.
- But when taken in large doses, it causes blisters in the mouth, throat and severe gastroenteritis, dyspnea, tachycardia, cyanosis, hypotension, dilated pupils, loss of reflexes, delirium, coma and death.

Fatal Dose : 5 to 10 gm / 5-8 seeds.

Fetal period : 12 to 24 hours.

Treatment:

- The treatment is mainly symptomatic.
- When applied externally, the parts are washed with water and bland liniments are applied.

Postmortem Appearance:

- Bruise like blisters are seen in area of contact.
- Blister are seen in the mouth, throat and stomach which are congested and inflamed.
- Stomach-congested and inflamed.
- Liver may show degenerative changes.

Medico-legal Importance:

- Accidental poisoning may result from the administration of juice internally by quacks.
- Homicidal and suicidal poisoning is rare but some cases are noted.
- For criminal abortion, the juice of nut is applied to the cervical os.
- Sometimes, the juice is introduced into the vagina as a punishment for infidelity.
- To support a false charge of assault, the juice is applied to skin which produces lesions simulating bruises.
- The juice is used to produce opthalmia.
- The juice may be thrown into body to cause injury by the enemies.

Method of Shodhana:

The seeds are put into a bag containing coarse brick powder with which they are rubbed carefully, with a view to reduce oil contents. Then it is removed, washed and dried. Such bhallataka without taila and twak is called as shuddha¹.

औषध योगः

अमृतभल्लातक लेह्य, भल्लातक तैल, कांकायनी वटि, भल्लातक क्षीरपाक,
भल्लातक लवण, etc.

Therapeutic dose : 1 to 3 रत्ति²

ARKA (अर्क)

Type of poison	:	Irritant poison
Botanical name	:	Calotropis procera (White flowers) Calotropis gigantea (Purple flowers)
Family	:	Asclepiadaceae
Varnacular Names		
Hindi	:	Ark, Madar
English	:	Madar, Gigantic swallow wort.



Synonyms: सूर्यक्षीर, अर्कपर्ण, प्रताप, क्षीरपर्णः, तूलफलः।

Toxic part: Milky juice yielded when leaves and stem are cut.

Habit :

C. Gigantia:

Is a tall shrub, growing upto 3m high. Bark is furrowed and yellowish white.

१. इष्टिकाचूर्णं संयुक्तं फलं भल्लातकोद्भवम् । पोटलीमध्यनिहितं घर्षयेन्नतिवेगतः ॥
ततः प्रतप्तो तोयेन क्षालयेदतियत्नतः । इत्थं तैलत्वचाहीनं भल्लातकं शुद्धिमाप्नुयात् ॥ (र.त. २४/४७७)
२. गुञ्जकतः समारभ्य गुञ्जात्रितयसंमितम् । भल्लातकं प्रयुञ्जीत बलकालाद्यपेक्षया ॥ (र.त. २४/४८२)

Branches are stout, covered with fine cottony pubescence.

Leaves	-	10-20 cm long obovate oblong, clothed beneath with fine cottony tomentum.
Flower	-	Purplish or white in axillary pedunculate corynos.
Fruits	-	8-10 cm long, fleshy green.
Seed	-	Numerous with silky hair.

C. Procera :

A shrub upto 2-2.5 m high. Young parts clothed with white cottony tomentum.

Leaves- Ovate - Oblong.

Flowers- Purple

Latex :

The juice forms into a white clot leaving a clear, straw coloured serum when allowed to stand for some time or heated. This clot yields a yellowish brown resin and white crystalline substance. The resin is slightly poisonous while white crystalline substance is nonpoisonous which is insoluble in water, soluble in organic solvents. The straw coloured serum contains 3% solids, and is highly toxic, which has white crystalline substance gigantini which is soluble in alcohol but sparingly soluble in water.

Rasa Panchaka:

रस - तिक्त - कटु

गुण - लघु, रुक्ष, तीक्ष्ण

वीर्य - उष्ण

विपाक - कटु

Toxic Chemical Constituent:

Uscharin, calotoxin, calactin, calotropin, gigantini.

Signs and Symptoms:

External Application:

- When applied externally to skin it causes redness and inflammation and vesication.
- When instilled into eyes, it produces irritation, inflammation, conjunctivitis and may also result in permanent impairment of vision.

Internal Administration:

- When taken internally, gives rise to acrid, bitter taste and burning pain in throat and stomach followed by salivation, stomatitis, vomiting, diarrhea, dilate pupil, tetanic

convulsion, collapse and death.

Fatal dose - Uncertain.

Fatal period - $\frac{1}{2}$ hr - 8 hrs.

Treatment:

Stomach wash, administration of demulcents and stimulants and other drugs as indicated by symptoms.

Postmortem Appearance:

- Signs of irritation in the intestine and stomach.
- Bloody discharges in nostrils and mouth
- Congestion of small intestine, liver, spleen, kidneys.
- Congestion of brain and its membrane
- Heart is empty
- Trachea was inflamed.

Medico-legal Importance:

- Abortifacient.
- Used for infanticide by mixing in milk.
- To produce artificial bruise.
- Rarely employed for suicide or homicide.
- Ingestion over dosage in therapeutic misuse.
- Is used as a cattle poison and an arrow poison.

Method of Shodhana:

Arka ksheera is triturated with chinchapatra swarasa¹.

औषध योगः

Arka lavana, Arka taila, Arkeshwara rasa etc.

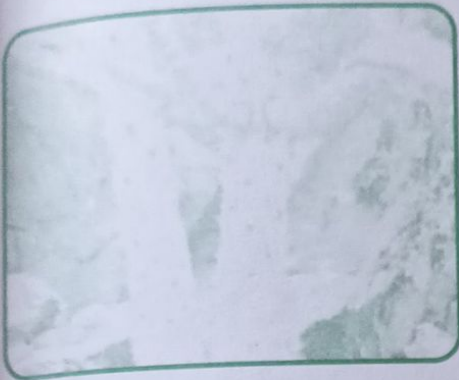
SNUHI (सुही)

Type of poison	:	Irritant poison
Botanical name	:	Euphorbia nerifolia
Family	:	Euphorbiaceae
Vernacular Names:		
Hindi	:	Sehund, Tidhara
English	:	Milk hedge

१. चिंचापत्रं जले पिष्ट्वा मर्दयेत् शान्तिं कृत् सदा । (अनुपानमंजरी ३/१५)

Synonyms:

सुधाक्षीर, सेहुण्ड क्षीर, स्नुही दुग्ध, सुधादुग्ध, स्नुग्दुग्ध ।



Toxic part : An acid, milky juice exuded from the stem.

Habit:

A large branched shrub or small tree with pairs of stipular spines on fubercles.

Leaves – Fleshy (usually only present in rainy season).

Involucres yellowish, 3-7 in cyme.

Fruits – Three compartment capsules

Rasa Panchaka:

रस	- कटु
गुण	- स्निग्ध, तीक्ष्ण
वीर्य	- उष्ण
विपाक	- कटु

Toxic Chemical Constituent:

Euphorbin, Nerifoliol, nerifolene, Calcium malate, Euphol.

Signs and Symptoms:

External Application:

- When applied to skin, produces vesication.
- When dropped into eye, it produces inflammation and may affect the eye sight.

Internal Administration:

- Acts as irritant causing vomiting, diarrhoea, convulsions and coma.
- It is also used for procuring criminal abortion.

Fatal dose – A teaspoonful of juice

Fetal period – 3 days

Treatment:

Stomach wash, administration of drugs indicated by symptoms.

Postmortem Appearance:

Not specific and characteristic. Gangrenous patches in stomach. Spleen may be found in a rotten condition.

Medicolegal Importance:

- Used for producing criminal abortions.
- Rarely used for homicidal purpose. Juice is poured into eyes as a punishment for infidelity.
- Accidental not common.

Method of Shodhana:

Two पल of Snuhi is taken along with 2 तोल of filtered चिञ्चा पत्र स्वरस in a clean wide mouthed container. The vessel is placed under sun and dried until the watery content is evaporated¹.

औषध योगः

Snuhi ksheera ghrita, Maha marichadya taila etc.

स्नुक् पयः तीक्ष्णविरेचनानाम् (च.सू. २५)

Used as तीक्ष्ण विरेचक.

LANGALI (लाङ्गली)

Type of poison	:	Organic irritant poison Abortifacient
Botanical name	:	Gloriosa superba
Family	:	Liliaceae
Varnacular Names:		
Hindi	:	Karihari
English	:	Malabar glory lily, dimbing lily

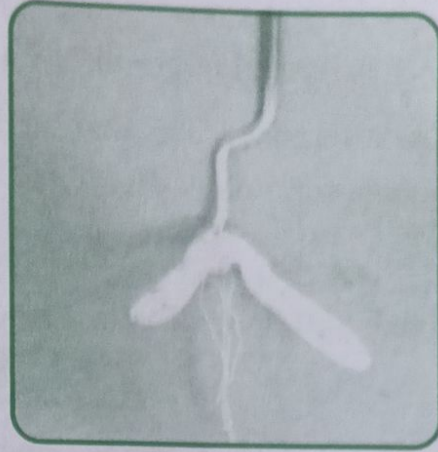
Synonyms:

कालिहारिका, अग्निजिह्वा, स्वर्णकुसुमा, सुमनोहश, नवतेन्दुपुष्पिका etc.

Toxic Part :

Root: The root. is tuberous, fibrous, juicy, flattened or cylindrical, long and creamish white coloured.

१. पलद्वयं सुधादुग्धं तोलकद्वयसंमिते । चिञ्चादलद्रवे वस्त्रपूते धर्मे विशोषयेत् ॥
द्रवं विशुष्कं विज्ञाय सुधादुग्धं समाहरेत् । ततः सर्वत्र योगेषु प्रयुज्जीत भिषग्वरैः ॥ (र.त. २४/५१७)

**Habit :**

It is a herbaceous tall glabrous branching climber. It grows in the low jungles throughout India. It bears a beautiful flower, flowering usually seen in the end of rainy season. The colour of the flowers is bright like fire. A spiral comes out at the end of its leaves. With the help of this it climbs on other trees.

Rasa Panchaka:

रस	-	कटु, तिक्त
गुण	-	लघु, तीक्ष्ण
वीर्य	-	उष्ण
विपाक	-	कटु

Toxic Chemical Constituent:

Colchicine, colchicamide, superbine etc.

Signs and Symptoms:

Burning and numbness in the mouth and throat, nausea, violent vomiting, purging, ataxia, spasms, convulsions, profuse sweating and collapse and respiratory failure.

Fatal dose : Greater than 0.75 gm

Fatal period : Not specific

Treatment : Symptomatic

The patient should be treated for shock. It is important to maintain the blood pressure.

Post mortem appearance: No specific features are noticed.

Medico Legal Importance:

Used as an abortifacient in criminal abortion as it is an uterine stimulant.

Method of Shodhana:

- The tuber is soaked in gomutra for a day¹.
- One more reference states that the tuber is cut and soaked in takra mixed with saindhava lavana for 5 days. Everyday the takra should be changed. (आ.प्र.)

औषध योग:

Langalyadi vati, langali taila, Langalyadi choorna etc.

KARAVEERA (करवीर)

Type of poison : Cardiac poison

Botanical name : (1) Nerium odorum- White oleander
(2) Cerebra thevetia/- Yellow oleander
Thevetia nerifolia

Family : Apocynaceae

Varnacular Names

English : Oleander, Indian oleander, Rose berry spung, Sweetscented oleander

Hindi : Kanera, Kaner

Types According to Ayurveda (र.तरं.)

→ श्वेत

→ पीत

→ रक्त

Synonyms:

करवीर, अश्वमारकः हयमारकः, अश्वमोहकः, कणवीरः



१. लाङ्गली शुद्धिमायाति दिनं गोमूत्र संस्थिता। (आ.प्र.६/११२)

Toxic part— All parts, specially seeds, stem and root.

Rasa Panchaka:

रस	-	कटु, तिक्त,
गुण	-	लघु, रुक्ष, तीक्ष्ण
वीर्य	-	उष्ण
विपाक	-	कटु

Nerium odorum: White oleander.

Habit:

- A large glabrous evergreen shrub with watery juice.
It's an ornamental herb
- Leaves— Linear, lanceolate, in threes shortly stalked, dark green and shining above acuminate tip, stout petiole numerous nerves spreading horizontally.
- Flowers— Red, rose coloured or yellow, or white, fragrant.
- Seeds— 1/2 inch long, tipped with a coma of light brown hairs.
- Fruits— Black, globular and fleshy.

Habitat: Extensively cultivated all over India.

Toxic Chemical Constituent:

1. Nerin with 3 glycosides: (a) Neriodorin
(b) Neriodorein
(c) Karabin

2. Oleandrin

Signs and Symptoms:

- Locally contact dermatitis.
- Inhalation of flowers may cause headache, dizziness, respiratory difficulty and nausea.

Ingestion:

- Nausea, vomiting, pain in abdomen.
- Difficulty in swallowing, frothy salivation.
- Lock jaw
- Muscular twitching and tetanic spasms of extremities.
- Tachycardia.
- Slow and weak pulse.

- Ventricular fibrillation.
- AV block.
- Exhaustion, drowsiness, coma.
- Respiratory paralysis and death due to cardiac failure.

Fatal dose : 5-15 leaves.

15 - 20gms of root.

Fatal period : 24 hrs.

Treatment:

- Gastric lavage.
- Symptomatic treatment.
- Atropine/Adrenaline/Noradrenaline may be used to increase heart rate.
- Correction of fluids and electrolyte balance.
- Maintenance of B.P.
- Treatment of arrhythmias and heart block.

Post mortem Appearances:

- These consist of signs of gastro intestinal irritation.
- Congestion of various organs.
- Generalized engorgement of veins and subendocardial ecch-ymosis.
- Yellow oleander resists putrefaction and can be detected even years after death in exhumed putrefied bodies.

Medico-legal Importance:

- Suicidal is very common.
- Accidental by its misuse.
- Used to produce illegal abortions.
- Also used as cattle poison.
- Is used as a love philter- it increases the attraction between the giver and the taker.

Cerebra Thevetia/Thevetia Nerifolia:

Poisonous part: All parts especially leaves and fruits.

Toxic Chemical Constituent:

Cerberin, thevetin, thevotoxin- glycosides found in the milk juice exudating from the plant.

Signs and Symptoms:

- Burning pain in the mouth, oesophagus and stomach followed by dryness, a sensation of tingling and numbness of the tongue.
- Vomiting and diarrhoea.
- Headache, dizziness, sense of fainting, dilated pupils.
- Irregular pulse.
- Fall in blood pressure.
- Heart block is common.
- Drowsiness, collapse, coma.
- Patient dies of peripheral circulatory failure.
- Convulsions may precede death.

Fatal dose : 8-10 seeds
15-20 gms of root
5-10 leaves

Fatal period : 24 hrs.

Treatment:

- Gastric lavage.
- Symptomatic treatment.
- Atropine/Adrenaline/Noradrenaline may be used to increase heart rate.
- Correction of fluids and electrolyte balance.
- Maintenance of B.P.
- Treatment of arrhythmias and heart block.

Post Mortem Appearances:

- These consist of signs of gastro intestinal irritation.
- Congestion of various organs.
- Generalized engorgement of veins and subendocardial ecchymosis.
- Yellow oleander resists putrefaction and can be detected even years after death in exhumed putrefied bodies.

Medico-legal Importance:

- Suicidal is very common.
- Accidental by its misuse.
- Used to produce illegal abortions.
- Also used as cattle poison.

Method of Shodhana:

Karaveera seeds, just like vatsanabha, are to be boiled in a dolayantra filled with godugdha for 1 prahara for its shuddi¹.

औषध योगः

करवीराद्य तैल

कासीसादि तैल

TOBACCO

Type of poison : Cardiac poison.

Botanical name : *Nicotiana tabacum*

Family : Solanaceae

Vernacular Name:

Hindi : Tambaku

English : Tobacco

Synonyms : ताम्रपर्णी

Habit:

An erect, robust annual little branched herb with large oblong acuminate sessile leaves, growing upto 2.5 m height. It has long trumpet shaped white pinkish flowers. All parts are sticky, covered with short viscid glandular hairs, which exude a yellow secretion containing nicotine.

Habitat:

Cultivated in tropical of India, originally native plant of America.

Toxic Part:

Tobacco is the leaf of tobacco plant. The dried leaves are chewed or used in the form of smoke or snuff. All parts of the plant except the ripe seeds are poisonous and contain the alkaloid nicotine as the active principle.



Rasa Panchaka:

रस	-	कटु, तिक्त
गुण	-	लघु, रुक्ष
वीर्य	-	उष्ण
विपाक	-	कटु

Toxic Chemical Constituent:

- Leaves yield two active principles, nicotine and nornicotine.
- This alkaloid act as agonists at nicotinic acetylcholine receptors which are present in the central and autonomic nervous systems and the neuromuscular junction. These alkaloids are absorbed almost through cell routes of exposure, cross blood brain barriers and placenta. It acts on the autonomic ganglia which are stimulated initially, but are depressed and blocked at later stage. It also acts on the somatic neuromuscular junction & afferent fibres from sensory receptors.

Signs and Symptoms:**Inhalation:**

- Dizziness
- Nausea
- Vomiting
- Headache
- Perspiration
- General weakness
- Mild rise in blood pressure with increased pulse rate. These symptoms subside in a few hours.

Ingestion:**Acute Poisoning Symptoms:**

- Burning sensation in the mouth, throat and stomach.
- Salivation, nausea, headache, vomiting, severe diarrhoea.
- The breath stinks of tobacco.
- Giddiness, numbness, muscular weakness.
- Passing into prostration, convulsions.

Cardiopulmonary:

- Early stage : Bradycardia, hypotension, cardiac arrhythmia.

- Later stage: Tachycardia, hypertension, tachypnea, respiratory depression.
- Death may occur from respiratory failure.

CNS- Miosis, headache, confusion, ataxia, restlessness etc.

Chronic Poisoning Symptoms:

- Chronic poisoning results from the continued use of tobacco by chewing, smoking or from exposure to nicotine during processing, storage or insecticide spray.

Those who Chew Tobacco:

- Chronic cough
- Laryngitis
- Pharyngitis
- Bronchitis

Those who handle it suffer from: Dermatitis

In all, Tobacco Causes:

- Stains on teeth.
- Bad odour during breathing.
- Blindness
- Cardiac arrhythmia, extra systole and chest pain suggesting angina pectoris.
- Thromboangitis obliterans is common.
- Increase in the incidence of cancer of mouth, tongue, throat, larynx and lungs is common.

Fatal Dose:

About 60 mg of nicotine/about 2 gms of crude tobacco.

Fatal Period:

- Death may occur rapidly in a few minutes when nicotine is swallowed.
- It may be delayed for a few hours.

Treatment:

- If nicotine has contaminated the skin, it should be removed by flooding the skin with water and scrubbing it vigorously with soap.
- If ingested-stomach wash and warm water containing activated charcoal, tannin strong tea, potassium permanganate. A pur-gative such as sodium sulphate 15 gms in 100 ml of water is useful.

- Mecamylamine (Inversine) is the specific antidote given orally.
- Artificial respiration and oxygen may be necessary.
- Symptomatic treatment.
- In chronic cases the patient should be removed from the risk of further exposure.
- Saline purgative and atropine injection should be given.

Postmortem Appearances:

- Post mortem appearances are similar to those of asphyxia.
- If nicotine has been swallowed, the odour of tobacco and fragments of leaves may be noticed on opening the stomach.
- Mucous of stomach and intestines is congested.
- The brain, lungs and liver are usually congested.

Medicolegal Aspects:

- Nicotine is a drug of addiction and leads to psychological dependence.
- In many cases, the poisoning is mainly accidental and occur from.
 1. Chewing a large dose
 2. Ingestion of the decoction
 3. Absorption through skin when applied as a poultice.
 4. Excessive smoking.
 5. Exposure to fertilizers insecticides and fumigants.
- Used for infanticide in certain parts of India.
- It resist purification

PARTHENIUM HYSTEROPHORUS

- Family** : Asteraceae
- English** : Congress grass, Carrot grass, Santa Marria etc.
- Type of poison:** Irritant
- Habitat** : Tropical and subtropical countries of the world.
- Habit:** It is much-branched, annual, erect, herbaceous plant that forms a basal rosette of leaves. It usually grows 0.5-1.5 m tall. Numerous small flower-heads are arranged



in clusters at the tips of the branches and are white or cream in colour having five tiny 'petals'

Signs and Symptoms:

- Itching and blisters on eyelids, neck face etc.
- Parthenium induces severe dermatitis and other allergic symptoms.
- Parthenium pollen causes nasobronchial allergy.
- Itching.
- Erythematous eruption.
- Loss of hair.
- Depigmentation of skin.
- Development of oedema ulceration and lesion in mouth and intestine.
- It causes general illness asthmatic problems, stretching and craking of skin.
- Stomach pain.
- Causes rhinitis and sinusitis.
- Sneezing, coughing, chest tightening, fatigue, fever, wheezing.

Treatment:

- Moving the individual away from the place of its growth.
- Treat with nasal spray and corticosteroids are used.
- Apply mustard oil to the affected area.

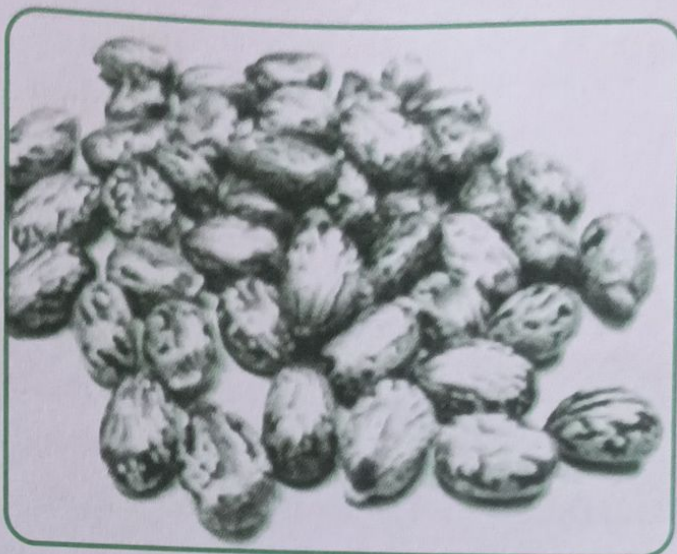
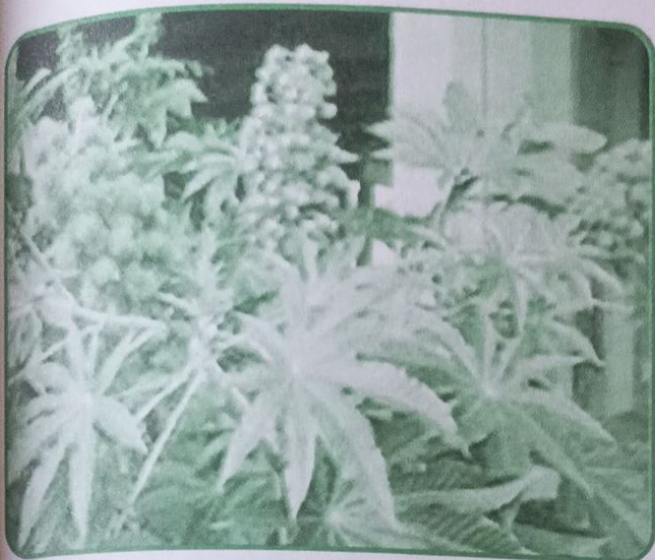
ERANDA

Type of poison	:	Organic irritant poison
Botanical name	:	Ricinus communis
Family	:	Euphorbiaceae
Vernacular name	:	
English	:	Castor oil plant
Hindi	:	Erandi/Erاند/Arandi

Synonyms:

गन्धर्वहस्त, दीर्घदण्ड, वर्धमान, व्याघ्रपुच्छ, चित्र, वातारि, वातघ

Poisonous part: Seeds are oval shaped, upto 1.5 cm in length, brownish grey in colour, mottled with dark brown or black. Seeds have disagreeable odour.

**Habit:**

A large shrub or a small tree with many branches.

Leaves: Simple leaf, palmately lobed, alternate phyllotaxy long petiole, palmate venation, dentate margin.

Inflorescence: A terminal raceme.

Fruit: Globus, dehiscent fruit, 3 seeded capsule.

Habitat: The plant grows all over India.

Toxic Chemical constituent: Ricin a toxalbumin/phytotoxin- It is a toxic protein which resembles a bacterial toxin in action and causes agglutination of red cells with some haemolysis. The press cake contains ricin and is poisonous, whereas castor oil contains ricinoleic acid and is not poisonous as it has no ricin. Unbroken seeds are non-poisonous.

Rasa Panchaka:

रस	-	मधुर, कटु, कषाय
गुण	-	स्निग्ध, तीक्ष्ण, सूक्ष्म
वीर्य	-	उष्ण
विपाक	-	मधुर

Signs and Symptoms:

Dust of the seeds may cause watering of the eyes, conjunctivitis, sneezing, acute nasal inflammation, headache, dermatitis and gastric upset.

Symptoms include:

Burning in mouth, throat and stomach
Salivation
Nausea and vomiting
Bloody diarrhoea
Abdominal pain

Thirst
 Impaired sight
 Weak rapid pulse
 Dehydration and cramps are common
 Drowsiness
 Shallow breathing
 Uraemia and jaundice
 Coma and convulsion may precede death.

Fatal Dose : Ten seeds (6 mg of Ricin)

Fatal Period : Two to several days.

Treatment : Gastric lavage, Demulcents, symptomatic.

Post mortem Appearance:

- The mucosa of gastro intestinal canal is congested, softened and inflamed with occasional erosions and submucous haemorrhages.
- Dialation of heart, haemorrhage in the pleura, oedema of the liver, kidneys, spleen and lung are seen. Fragments of seeds may be found in the stomach or intestines.
- The blood is usually seen in serous cavities.

Medicolegal Aspects:

- Accidental poisoning may occur in children from eating the seeds.
- Rarely the powdered seeds are given for homicide. The powder of seeds causes conjunctivitis when applied to the eyes.

Method of Shodhana:

- The selected eranda seeds are to be tied in a cloth as pottali and subjected for swedana in dolayantra for one yama (3 hours) keeping tender coconut water as liquid media. Later the seeds are washed with warm water, dried under sun and used for pharmaceutical procedures.¹

CHITRAKA

Type of poison	:	Organic irritant poison
Botanical name	:	Plumloago zeylanica
Family	:	Plumbaginaceae
Vernacular Name	:	
English	:	Lead wort
Hindi	:	Chit/chira/chitra

Synonyms:

अनलनामा, पाठी, व्याल, दारुण, अग्निक, दीपक

Toxic part : Roots

Habit:

It is a perennial herb.

Leaves: Simple, alternate ovate, petiolate, but a short petiole.



Inflorescence : Long terminal spike inflorescence.

Fruit : Ovate, enclosed within persistent calyx.

Habitat : It is extensively cultivated throughout India.

Toxic Chemical constituent: Plumbagin, Chitranane, plumbagic acid.

Rasa Panchaka:

रस - कटु

गुण - लघु, रुक्ष, तीक्ष्ण

वीर्य - उष्ण

विपाक - कटु

Signs and Symptoms:

- When applied externally, the roots produce painful irritation and blisters.
- While administered internally they act as a narcotic irritant poison, producing burning pain from mouth to stomach, vomiting, thirst, diarrhoea, collapse and death.

Fatal Dose : Uncertain

Fatal period : Uncertain

Treatment : Stomach wash, demulscents and symptomatic.

Post Mortem Appearance:

Signs of gastroenteritis and congestion of internal organs are found.

Medico Legal Importance:

- 1) Roots are taken by mouth or applied as paste to the cervix or to abortion stick for criminal abortion.
- 2) Roots are rarely used for homicide.
- 3) Sometimes the paste made from the roots is applied to skin to stimulate a bruise.

Method of Shodhana:

The roots of rakta chitraka are cut into smaller pieces and kept immersed in lime water for twenty four hours. Later the roots are taken out, with hot warm water, dried and preserved for further pharmaceutical procedures¹.

हृत्पत्रा

Type of poison	:	Cardiac poison
Botanical name	:	<i>Digitalis purpurea</i>
Family	:	Scrophulariaceae
Vernacular Name	:	
English	:	Common Foxglove
Hindi	:	Tilpushpi

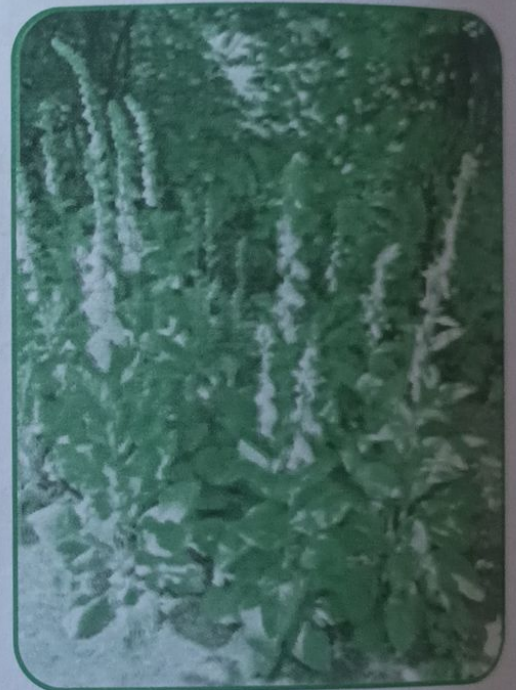
Toxic part: Whole plant is poisonous, but leaves are more poisonous.

Habit:

It is a herb, leaves are simple, often lower leaves are opposite and upper alternate. Flowers are glove shaped. Fruit is a capsule with numerous seeds.

Rasa Panchaka:

रस	-	तिक्त
गुण	-	लघु रुक्ष
वीर्य	-	उष्ण
विपाक	-	कटु
प्रभाव	-	हृद्य



Toxic Chemical constituent: Several glycorides like digitoxin, digitalin, digitonin, digoxin etc. are present in the roots, leaves and seeds.

Signs and Symptoms:

GIT: Burning pain in the mouth, bitter taste, dryness of throat and numbness of tongue.

Nausea, vomiting followed by abdominal pain and perhaps watery diarrhea.

१. रक्तचित्रकमूलं तु चूर्णतोये निमज्जयेत्। ततो निदाघसंशुष्कं शुद्धिमायात्यनुत्तमाम्। (R.T. 24/575)

CNS: Severe headache, fatigue, fainting, muscle weakness, neuropsychiatric disorders, confusion, anxiety depression, drowsiness delirium, hallucinations etc.

Visual: Blurring of vision, dilated pupils, photophobia, colour aberration etc.

CVS: Bradycardia, arrhythmias, extrasystoles, ventricular tachycardia and fibrillation, atrial flutter and fibrillation, SA block, AV block.

Fatal dose: 15-30 mg: digitalin

4 mg: digitoxin

10 mg digoxin

2 gm leaf powder

Fatal period: 1-24 hrs

Treatment:

- Stomach should be washed with a solution of tannic acid
- Bowels should be evacuated.
- Specific antidote such as 100 mg lignocaine IV or propranolol for digitalis induced arrhythmia and digoxin specific antibody fragments (Fa6)- one vial IV in 30 min for ventricular irritability.
- Trisodium EDTA may help to lower the serum calcium.
- Potassium salts to reduce extrasystols and tachyarrhythmias.
- Bradycardia should be treated with atropine.
- The rest of the treatment is symptomatic.
- ECG monitoring is necessary as a guide of treatment.

Postmortem Appearances:

- Slight inflammation and irritation of gastric mucosa.
- Seeds and fragments of leaves may be found in stomach or alimentary canal.

Medico-legal Aspects:

This poison is mostly accidental, eating leaves by mistake and homicidal poisoning is also recorded.

CERBERA ODALLAM

Type of poison	:	Cardiac poison
Botanical name	:	Cerbera odallam
Family	:	Apocynaceae

Toxic Part:

Kernels of the seeds are poisonous. The two kernels of the seed which are pearly- white but when dry it may have a bluish tinge or it may become gelatinous. Milky acid juice exudes from all parts of the plant which are also poisonous.

Habit:

A shrub. Leaves dark green, fleshy lanceolate, long. Flower white like those of jasmine. Fruits resembles as mango, dark green encloser usually a single seed which is flattened.

Toxic Chemical constituent: Glucosides-cerberin, cerberoside, odollin, thevetin, cerapain.

Signs and Symptoms:

- Gastrointestinal irritation and cardiac toxicity.
- Bitter taste in the mouth with nausea, vomiting, abdominal pain and diarrhea.
- Irregular respiration, general weakness, bradycardia, collapse and death from heart failure.
- ECG may show sinus bradycardia, S-A block, atrial fibrillation and other arrhythmia.

Fatal dose: Kernel of one fruit.

Fatal period: 1-2 days.

Treatment:

- Gastric lavage
- Atropine 0.5 mg IV, repeated every 15-30 min to keep heart rate above 50/min.
- Treat hyperkalaemia to keep heart rate above 50/min.
- Maintenance of blood pressure.
- Maintenance of cardiac output.
- Treatment of arrhythmias and heart block.

Postmortem Appearances:

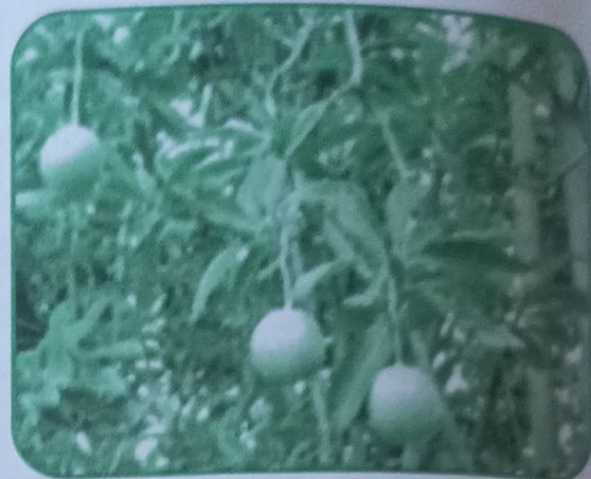
- Exaggerated folds in the mucous coat of his stomach.
- Surface is congested, deep red coloured.
- Liver is congested.
- Duodenum is brick red in colour. Irregular purple patch in the centre.

Medico-legal Importance:

Suicidal—kernel of fruit eaten by women to commit suicide mostly on account of dowry problems of matrimonial mishaps.

Accidental— Children eat the fruit mistaking it for an edible one.

Homicidal— Powdered kernel may be added to alcohol.



Important Questions

Long Questions:

1. Describe in detail the poisoning due to Vatsanabha.
2. Explain the Vishatinduka poisoning enumerating its signs and symptoms, treatment, P.M. Appearances and M.L. Importance along with its differential diagnosis.
3. Explain in detail Vijaya Poisoning.

Short Essay:

1. Ahiphena poisoning.
2. Signs and symptoms and treatment of Dhatura poisoning.
3. Signs and symptoms of Karaveera poisoning.
4. Difference between Kupeelu poison and tetanus.

Short Answers:

1. Risus sardonicus.
2. Jayapala poisoning.
3. Poisoning by Suis
4. Bhallataka poisoning.
5. Gunja Visha.
6. Poisoning due to latex of plants.
7. Hritpatri.
8. Snuhi.
9. Parthenium induced toxicity.
10. Stupefying poisons.

Gara Visha, Dooshi Visha Viruddhahara

GARA VISHA

Definition of Gara Visha

Gara visha is a variety of visha which is prepared artificially by the combination of substances either poisonous or non-poisonous. They are slowly metabolised or digested in the body, shows their effects after sometime and hence do not kill the person instantly.

गर संयोगजं चान्यद् गरसंज्ञं गदप्रदम्।

कालान्तर विपाकित्वात् न तदाशु हरत्यसून्।। (च.चि. २३/१४)

Intension of administration of gara visha:

सौभाग्यार्थं स्त्रियो भर्त्रे राज्ञे वाऽरातिचोदितः।

गरम् आहार सम्पृक्तं यच्छन्त्यासन्नवर्तिनः।। (अ.ह.उ. ३५/४८)

Women in order to get love from their husbands or the king or any person who is close to the king either by herself or because of the influence of the king's enemies, would administer gara visha mixed with the food in order to incapture the king/husband.

Method of Administration of Gara Visha:

नाना प्राण्यंगश मलान् विरुद्धौषधि भस्मनाम्।

विषाणाम् च अल्पवीर्याणाम् योगो गर इति स्मृतः।। (अ.सं.उ. ४०/६२)

Combination of different body parts of animals and their excreta or the excreta of different body parts of animals, the ashes of drugs with incompatible potency (Veerya) and poisonous substances of mild potency is known as gara visha.

सौभाग्यार्थम् स्त्रियः स्वेद रजो नानाङ्गजान् मलान्।

शत्रु प्रयुक्तांश्च गरान् प्रयच्छन्ति अन्न मिश्रितान्।। (च.चि. २३/२३३)

Women in order to gain favour from their husband or the king, either by their own or due to the influence of the king's enemies, serve their sweat, menstrual blood or different types of excreta of their body along with the food which acts as gara visha.

Signs and Symptoms of Gara Visha:

The person afflicted with gara visha exhibits different types of shareerika and manasika lakshanas.

Shareerika Lakshana (शारीरिक लक्षण):

पाण्डु	-	Anaemia
कृश	-	Emaciation
अल्पाग्नि	-	Poor digestion
कास	-	Cough
श्वास	-	Breathlessness
ज्वर	-	Pyrexia
प्रतिलोम of वायु	-	Deranged movement of vata.
महा उदर	-	Abdominal enlargement
महा यकृत	-	Hepatomegaly
महा प्लीह	-	Splenomegaly
दीनवाक्	-	Slow speech/low pitched speech/feeble voice
दुर्बल	-	Lazy
शोफ	-	Oedema (all over the body)
सतत आध्मान	-	Continuous distension of abdomen
शुष्कपादकर	-	Dryness of palms and sole
क्षय	-	Depletion of dhatus

Manasika Lakshana (मानसिक लक्षण):

स्वप्नचिन्तापरायण- Person is always either dreamy or tensed.

स्वप्ने गोमायु-मार्जार-नकुल-व्याल-वानर- In his dream he visualises animals like jackal, cat, mongoose, snake, monkey etc.

प्रायः पश्यति शुष्कांश्च वनस्पति जलाशयान्- Dreams of dry trees or ponds.

मन्यते कृष्णमात्मानं गौरो गौरंच कालकः- Thinks that he has become black instead of fair or vice versa.

विकर्ण नासा नयनं पश्यते तद्विहतेन्द्रियः- Sees his ears, nose, eyes etc as rough and distorted.

The patient of gara visha may suffer from these and many other difficult and dreadful symptoms and if not treated soon may die.

Treatment**1. Nidana Parivarjana (निदान परिवर्जन)**

Gara is administered intentionally to a person and hence when the signs and symptoms of gara are suspected, the physician should do a proper interrogation of the patient regarding what food was taken, when it was taken, along with whom it was taken and so on so as to

detect the means through which gara visha is administered and hence it can be avoided.

तम् आवेक्ष्य भिषक् प्राज्ञः पृच्छेत् किं कैः कदा सह जग्धमित्यवगम्य । (च.चि. २३/२३८)

2. Vamana and Hridaya Shodhana (वमन और हृदय शोधन):

.....आशु प्रदद्यात् वमनं भिषक् ।

सूक्ष्मं ताम्र रजस्तस्मै सक्षौद्रं हृदिशोधनम् । (च.चि. २३/२३९)

Having done with proper interrogation, the patient should instantaneously be given vamana with tamra choorna mixed with honey which also causes hridaya shodhana.

3. Hema Prashana (हेम प्राशन):

शुद्धे हृदि ततः शाणं हेमचूर्णस्य दापयेत् । (च.चि. २३/२३९)

After hridi shodhana the patient should be given one shana (शाण) matra of swarna bhasma.

हेम सर्व विषाण्याशु गरांश्च विनियच्छति ।

न सज्जते हेमपाङ्गे विषं पद्मदले अम्बुवत् । (च.चि. २३/२४०)

The intake of gold immediately counter acts all the poisons including the gara visha. The poison does not stick to the body if the patient has taken gold, just as water does not stick to a lotus leaf.

4. Agada Pana:

Moorvadi Agada (मूर्वादि अगद):

मूर्वा अमृत नत कणा पटोली चव्य चित्रकान् । वचा मुस्त विडङ्गानि तक्रकोष्णाम्बु मस्तुभिः ।

पिबेत् रसेन वा अम्लेन गरोपहत् पावकः । (च.चि. ३५/५७-५८)

Moorvadi agada is administered when the agni is affected by gara visha. The drugs moorva, amruta, nata, kana, patola, chavya, chitraka, vaca, musta, vidanga are powdered and taken along with takra, hot water, dadhi mastu, mamsa rasa or bheejapooru rasa.

Naagadantyadi Ghrita: (च.चि. २३/२४१)

Buffalo ghee cooked with naagadanti, trivrit, danti, dravanti, latex of snuhi and madanaphala along with one adhaka of cow's urine is useful in curing patients suffering from the poisons of snakes and insects and from gara.

Sharkara Suvrnadi Yoga: (अ.ह.उ. ३५/५६)

The combination of suvarnamakshika bhasma and swarna-bhasma given along with sugar and honey cures gara visha.

Paaravatadi Hima: (अ.ह.उ. ३५/५९)

The hima prepared from pigeons meat, shati and pushkara-moola cures gara and other disorders produced by it.

DOOSHI VISHA

(Impoverished or Weak Poison)

Definition:

यत् स्थावरं जाङ्गमं कृत्रिमं वा देहादशेषं यदनिरगतं तत्।

Any poison— be it sthavara, jangama or krithrima which following treatment has not been eliminated from the body completely gets converted into a dushi visha.

The poisons that have entered into the body should be thoroughly treated by proper and potent antidotes. If the drugs are not potent enough to neutralize the visha or if the treatment is not in accordance with the dhatus or if the medicine is not given in recommended dosage for the specified period of time to pacify the visha, the visha will not get neutralized or cured properly and as a result, some traces of it remains in the body as dushi visha.

जीर्णं विषघ्नौषधिभिर्हतं वा दावाग्निं वातातपं शोषितं वा।

स्वभावतो वा गुण विप्रहीनं विषं हि दूषीविषतामुपैति।। (सु.क. २/२५)

Any poison which has become old, which is inadequately neutralised by the antidotes, dried by the breeze, forest fire, sunlight or that which by its nature itself is not endowed well, with all the properties of a visha can be identified as a dushi visha.

वीर्यल्पभावत् न निपातयेत्तत् कफावृतं वर्षगणानुबन्धि। (सु.क. २/२६)

As this dushi visha is less virulent, it does not produce any immediate symptom in the body but gets enveloped by the kapha and lies dormant in the body for several years.

दूषितं देश काल अन्न दिवास्वप्नैरभीक्ष्णशः।

यस्माद् दूषयते धातून् तस्माद् दूषीविषं स्मृतम्।। (सु.क. २/३३)

On exposure to a particular place (anupa desa), time (cloudy/windy day), diet (wine, sesamum, kulatha etc) and constant day sleeping, if the dhatus get vitiated, it should be considered to be by the dushi visha.

Prakopa Kala:

प्राग्वत् अजीर्णं शीताभ्रं दिवास्वप्नं अहिताशनैः।

दुष्टं दूषयते धातून् अतः दूषीविषं स्मृतम्।। (अ.ह.उ. ३५/३७)

That visha which on exposure to the pragvata (wind from east), ajeerna (indigestion) शीत (cold breeze) cloudy weather, दिवास्वप्न (day sleeping) and अहिताशन (unsuitable foods); get vitiated and further vitiates the dhatus is called as a dushi visha.

कोपं च शीत अनिल दुर्दिनेषु यत्याशु.....। (सु.क. २/२९)

It gets aggravated on a cloudy day and by exposure to cold and wind.

Poorvaroopo:

निद्रा गुरुत्वं च विजृम्भणं च विश्लेषहर्ष अथवा अंगमर्दः । (सु.क. २/२९)

Sleepiness, heaviness, yawning, a sense of looseness in the joints, horripilation and body ache are the prodromal symptoms of dushi visha.

Roopa/Lakshana:

तेनार्दितो भिन्न पुरीषवर्णो विगन्ध वैरस्य मुखः पिपासी ।

मूर्च्छन् वमन् गद्गद वाग्विषणो भवेच्च दूष्योदर लिङ्गजुष्टः । । (सु.क. २/२८)

The person affected by dushi visha presents with the following symptoms.

Diarrhoea

Discolouration of skin

Bad smell and taste in the mouth

Thirst which is profound

Fainting

Vomiting

Stammering speech

In grief and is timid.

Symptoms of dushyodara

दूषीविषं तु शोणित दुष्ट्य अरुः किटिभ कोठ लिङ्गं च ।

विषम् एकैकं दोषं सन्दूष्य हरत्यसूनेवम् । । (सु.क. २३/३१)

Dushi visha vitiates the blood and causes pustules, exfoliation and urticarial rashes. It further affects the dhatus and causes death of the person.

Apart from the Above it also Causes¹:

अन्नमद	:	Intoxication after meals or toxicity of foods.
अविपाक	:	Indigestion
अरोचक	:	Anorexia
मण्डल	:	Skin eruptions with circular patches.
कोठ	:	Urticaria
मोह	:	Mental confusion
धातुक्षय	:	Depletion of the dhatus
पाद कर अस्य शोफं	:	Oedema in face, extremities

१. ततः करोत्यन्नमद अविपाक अरोचकं मण्डलकोठ मोहान् । धातुक्षयं पादकरास्यशोफं दकोदरं छर्दिमथातिसारम् ।।
वैषण्यमूर्च्छाविषमज्वरान्वाकुर्यात्प्रवृद्धाप्रबलां तृषांवा । उन्मादमन्यतृजनयेत्तथाऽन्यदानाहमन्यत क्षपयेच्चशुक्रम् ।।
गाद्रघमन्यज्जनयेच्चकुष्ठं तास्तान् विकाराश्च बहुप्रकारान् ।। (सु.क. २/२७-२८)

दकोदरं	: Ascites
छर्दि	: Vomiting
अतिसार	: Diarrhoea
वैवर्ण्य	: Discolouration
मूर्च्छा	: Fainting
विषमज्वर	: Intermittent high fever
प्रवृद्ध प्रबल तृषा	: Unquenchable thirst
उन्माद	: Insanity
आनाह	: Flatulence
शुक्र क्षय	: Depletion of shukra dhatu/semen
गाद्वद्य	: Muffled voice/stammering
कुष्ठं	: Several skin disorders
विकाराश्चबहुप्रकारान्	: Other disorders of various types

Sthananusara Lakshana: (Feature According to site of Lodging):

आमाशयस्थे कफवातरोगी पक्वाशयस्थे अनिलपित्तरोगी।

भवेन्नरो ध्वस्त शिरोरुहाङ्गो विलूनपक्षस्तु यथाविहङ्गः।।

स्थितं रसादिष्वथवा यथोक्तान् करोति धातु प्रभवान् विकारान्।। (सु.क. २/२८)

When dushi visha is localised in the amashaya the patient suffers with diseases of kaphavata, when in pakwashaya he suffers from diseases of vata pitta. This is accompanied with loss of hair, loss of strength appearing like a bird which has lost its wings. When it is lodged in the rasa and other dhatus, it gives rise to that particular dhatu pradoshaja vikaras.

Sadhyasadhyata:

A case of dushi visha in a prudent and judicious person and which is of recent origin is easily cured. One which is of more than a year is yapyā and in an emaciated person and patient who indulges in unsuitable food and activities, it is asadhya¹.

Upadrava:

ज्वरे दाहे च हिक्कायाम् आनाहे शुक्रसंक्षये। शोफे अतिसारे मूर्च्छायां हृद्रोगे जठरेऽपिच।।

उन्मादं वेपथौ चैवायेचान्येस्युरुपद्रवाः।। (सु.क. २/५३-५४)

The upadrava produced due to dushi visha include, fever, burning sensation, hiccups, flatulence, depletion of semen, fainting, diarrhoea, heart diseases, abdominal enlargement, insanity and tremors.

१. साध्यमात्मवतः सद्योयाप्यसंवत्सरोत्थितम् । दूषीविषमसाध्यं तु क्षीणस्याहितसेविनः।। (सु.क. २/५५)

Treatment:

दूषीविषातं सुस्विन्नम् ऊर्ध्वं च अधो शोधितम्।

दूषीविषारि अगदं लेहयेत् मधुनाऽऽप्लुतम्।। (अ.ह.उ. ३५/३८)

1. Shodhana:

The patient must be administered with urdhwa and adho shodhana (vamana and virechana) after proper snehana and swedana.

Importance of Swedana:

The word 'सुस्विन्न' highlights on the importance of samyak swedana. It should be done to remove the kapha avarana in dushi visha.

2. Raktamokshana:

Bloodletting in any possible method like shringa, alabu, pracchana, jalouka or siravyadha is to be adopted.

Agadapana:**Dooshivishari Agada:**

पिप्पल्यो ध्यामकं मांसी लोघ्नं एला सुवर्चिका। कुटन्नटं नतं कुष्ठं यष्टी चन्दन गैरिकम्।।

दूषिविषारिः नाम्नाऽयं न च अन्यत्रापि वार्यते। (अ.ह.उ. ३५/३९-४०)

Pippali, pippalimoola, dhyamaka, mamsi, lodhra, ela, suvarcika, kutannata, nata, kushta, yashti, chandana and gairika - this combination is called as dushivishari agada (usually made into a vati form with water) is consumed with honey, which is also indicated in other conditions of visha.

Treatment of Complications:

In case of complications, the remedies described under those respective diseases should be performed. (सु.क. २/५३-५४)

VIRUDDHAHARA (विरुद्धाहार)**Definition:**

यत् किञ्चित् दोषम् आस्राव्य न निर्हरति कायतः।

आहारजातं तत् सर्वम् अहितायोपपद्यते।। (च.सू. २६/८५)

Those diets and drugs which excites/vitiates various dosas but does not expell them out of the body are to be considered as viruddha/unwholesome/harmful.

यत् किञ्चित् दोषम् उत्क्लेश्य भुक्तं कायान्ननिर्हरत्।

रसादिषु अयथार्थवा तद्विकाराद्यकल्पते।। (सु.सू. २०/२०)

Those substances which when consumed make for the aggravation of the dosa, but do not expel them out of the body and which brings about abnormalities in the rasadi dhathus

giving rise to diseases are to be considered as unwholesome.

विरुद्धम् अपि च आहारं विद्यात् विष गरोपमम् ।। (अ.ह.सू. ७/२९)

Even the incompatible foods or viruddhahara must be treated as a poison, specially like gara visha.

Types of Viruddha:

Acharya Charaka has mentioned 18 types of viruddha.

यच्चापि देश काल अग्नि मात्रा सात्म्य अनिलादिभिः । संस्कारतो वीर्यतश्च कोष्ठ अवस्था क्रयैरपि ।।

परिहारो उपचाराभ्यां पाकात् संयोगतोऽपि च । विरुद्धं तच्च त हितं हत् संपद् विधिभिश्च यत् ।।

(अ.ह.सू. २६/८६-८७)

The following 18 types of viruddha are explained by Acharya Charaka.

- | | |
|---------------------|---------------------|
| (१) देश विरुद्ध | (१०) अवस्था विरुद्ध |
| (२) काल विरुद्ध | (११) क्रम विरुद्ध |
| (३) अग्नि विरुद्ध | (१२) परिहार विरुद्ध |
| (४) मात्रा विरुद्ध | (१३) उपचार विरुद्ध |
| (५) सात्म्य विरुद्ध | (१४) पाक विरुद्ध |
| (६) दोष विरुद्ध | (१५) संयोग विरुद्ध |
| (७) संस्कार विरुद्ध | (१६) हत् विरुद्ध |
| (८) वीर्य विरुद्ध | (१७) संपत् विरुद्ध |
| (९) कोष्ठ विरुद्ध | (१८) विधि विरुद्ध |

Acharya Sushruta has not classified viruddhahara in numbers, but has explained the following types.

- | | |
|-------------|-----------|
| (१) संयोग | (५) देह |
| (२) सात्म्य | (६) कर्म |
| (३) देश | (७) मान |
| (४) काल | (८) वीर्य |

(1) Desha Viruddha (देश विरुद्ध):

Consuming rooksha and teekshna dravyas in jangala desha (धन्व = Jangala desha) and snigdha and sheeta guna dravyas in anoopa desha is desha viruddha¹.

(2) Kaala Viruddha (काल विरुद्ध):

Consuming sheetala aahara and aushada in sheeta kaala and katu-ushna aahara in ushna kaala (greeshma ritu)².

१. विरुद्धदेशतस्तावद्रूक्षतीक्ष्णादिधन्वनि। आनूपेस्निग्धशीतादि भेषजंयन्निषेव्यते।। (च.सू. २६/८८)

२. कालतोऽपिविरुद्धं वच्छीतरुक्षादिसेवनम्। शीतेकालेतथोष्णेचकटुकोष्णादिसेवनम्।। (च.सू. २६/८९)

(3) Agni Viruddha (अग्नि विरुद्ध):

Jataragni is of 4 types- manda, teekshna, vishama and sama. Consumption of food which is not in accordance to these varieties of jataragni forms agni viruddha¹.

(4) Matra Viruddha (मात्रा विरुद्ध):

Consuming equal quantity of madhu and ghrita (ghee) together is matra viruddha².

(5) Satmya Viruddha (सात्व्य विरुद्ध):

For a person who is habituated to katu and ushna aahara, swadu and sheeta veerya aahara becomes satmya viruddha³.

(6) Dosha Viruddha (दोष विरुद्ध):

Consumption of ahara and aushada which are similar to the qualities of vatadi dosa but adverse to the person's practice constitutes dosha viruddha⁴.

(7) Samskara Viruddha (संस्कार विरुद्ध):

Those aahara and aushada which produce poisonous effect when prepared in a particular manner or during processing constitute samskara viruddha. For example the meat of peacock bird roasted on a castor stick⁵.

(8) Veerya Viruddha (वीर्य विरुद्ध):

Consumption of aahara and aushada which are cold in potency (शीत वीर्य) along with those which are hot in potency (उष्ण वीर्य) is considered as veerya viruddha⁶.

(9) Koshta Viruddha (कोष्ठ विरुद्ध):

Administration of medicines having manda veerya and mild purgatives to a person having, kroora koshta and on the contrary administering medications which are guru in nature and strong purgatives to a person with mrudu koshta is considered as koshta viruddha⁷.

(10) Avastha Viruddha (अवस्था विरुद्ध):

Consumption of the drugs and diets which are incompatible to one's state of health is considered as avastha viruddha.

Example: The use of foods which cause aggravation of vata dosa by the persons

१. विरुद्धमनलेतद्वदन्नपानंचतुर्विधे। (च.सू. २६/९०)

२. मधुसर्पिः समधृतमात्रायातद्विरुध्यते॥ (च.सू. २६/९०)

३. कटुकोष्णादिसात्व्यस्यस्वादुशीतादिसेवनम्यत्तत्सात्व्यविरुद्धं। (च.सू. २६/९१)

४. तु विरुद्धं त्वनिलादिभिः। यासमानगुणाभ्यासविरुद्धात्रौषधक्रिया॥ (च.सू. २६/९०)

५. संस्कारतोविरुद्धं तद्यद्भोज्यं विषवद्भवेत्। एरण्डसीसकासक्तं शिशिमांसं यथैव हि॥ (च.सू. २६/९२-९३)

६. विरुद्धं वीर्यतो ज्ञेयं वीर्यतः शीतलात्मकम्। तत्संयोज्योष्णवीर्येण द्रव्येण सह सेव्यते॥ (च.सू. २६/९३-९४)

७. क्रूरकोष्ठस्य चात्यल्पमन्दवीर्यमभेदनम्। मृदुकोष्ठस्य गुरु च भेदनीयं तथा बहु॥

एतत्कोष्ठ विरुद्धं तु.....। (च.सू. २६/९४-९५)

indulging in exertion, copulation and physical exercise and use of food which cause aggravation of kapha dosa by the persons who sleep more and are lazy constitutes avastha viruddha¹.

(11) Krama Viruddha (क्रम विरुद्ध):

Consumption of drugs and diets incompatible to the orders which have been said in one's day to day activities is considered as krama viruddha.

Example: Consumption of food by a person without elimination of urine and faeces, or when he is not hungry or when he is very much hungry etc².

(12) Parihara Viruddha (परिहार विरुद्ध):

Consuming ushna veerya aahara after consumption of meat of varaha etc is parihara viruddha³.

(13) Upachara Viruddha (उपचार विरुद्ध):

If one consumes sheetala jala after ghrita pana, it constitutes upachara viruddha⁴.

(14) Paka Viruddha (पाक विरुद्ध):

Consumption of food cooked using fuels of forbidden trees like dushtadaru, durdaru etc and consumption of food which is inadequately cooked or overcooked or burnt constitutes paka viruddha⁵.

(15) Samyoga Viruddha (संयोग विरुद्ध):

The diets and drugs which become incompatible by their combination is called samyoga viruddha such as mixing of foods having sour taste with milk⁶.

Fish and milk should not be taken together because both possess madhura rasa, madhura vipaka and they are maha abhishyandi. Moreover milk possesses sheeta veerya and fish ushna veerya, hence by the viruddha veerya of the drugs, rakta gets vitiated. Due to the abhishyandi guna, they cause the margaavarodha of dosha, dhatu and mala⁷.

Several other such combinations along with the list of disease produced by them are explained in the samhita.

१. श्रमव्यवासयव्यायामासक्तस्य अनिलकोपनम्।

निद्रालसस्यालसस्यभोजनं श्लेष्मकोपनम्॥ (च.सू. २६/९५-९६)

२. यच्चानुत्सृज्यविण्मूत्रं भुङ्क्ते यच्चाबुभुक्षितः। तच्च क्रमविरुद्धं स्याद्यच्चातिक्षुद्रशानुगः॥ (च.सू. २६/९७)

३. परिहारविरुद्धं तु वराहादीन्निषेव्यत्। (च.सू. २६/९८)

४. सेवेतोष्णघृतादींश्च पीत्वा शीतं निषेवेत्॥ (च.सू. २६/९८)

५. विरुद्धपाकतश्चापि वुष्टदुर्दारु साधितम्। अपक्वतण्डुलात्यर्थपक्वदुग्धं च यद्भवेत्॥ (च.सू. २६/९९)

६. संयोगतो विरुद्धं तद्यथाऽम्लं पयसा सह॥ (च.सू. २६/९९)

७. नमत्स्यान्पयसा सहाभ्यवहरेत्, उभयं ह्येतन्मधुरं मधुरविपाकं महाभिष्यन्दिशीतोष्णात्वाद्भिरुद्धवीर्यविरुद्ध-
वीर्यत्वाच्छोणितप्रदूषणाद्यमहाभिष्यन्दि त्वान्मार्गोपरोधाय च॥ (च.सू. २६/८२)

(16) Hridi Viruddha (हृदि विरुद्ध):

Consumption of food which is not liked by ones manas constitutes hridi viruddha¹.

(17) Sampat Viruddha (संपत् विरुद्ध):

Consumption of diets and drugs which have not yet acquired their natural taste or which have lost their natural taste or which have unnatural or bad taste is considered as sampat viruddha².

(18) Vidhi Viruddha (विधि विरुद्ध):

Consumption of food against the rules of eating as mentioned in aharavidhi constitute vidhi viruddha.

Ex: Eating in an open place³.

Signs and Symptoms of Viruddhahara:

Several diseases may be caused due to the regular intake of viruddhahara. These include⁴.

षाण्ड्य	-	Sterility	मद	-	Intoxication
अन्ध्य	-	Blindness	आध्मान	-	Tympanitis
विसर्प	-	A skin disea an acute spread	गलग्रह	-	Spasmodic obstructs in the throat
दकोदर	-	Ascitis	पाण्डु	-	Anemia
विस्फोट	-	Eruptions	आम	-	Toxemia
उन्माद	-	Insanity	किलास, कुष्ठ	-	Skin disorders
भगन्दर	-	Fistula			
मूर्च्छा	-	Fainting	ग्रहणी	-	Assimilation disorders
अम्लपित्त	-	Acid dyspep	शोथ	-	Oedema
ज्वर	-	Fever	पीनस	-	Rhinitis
सन्तानदोष	-	Foetal dis	मृत्यु	-	Death

Treatment of the Diseases Produced by Viruddhahara:

1. Vamana
2. Virechana

१. अमनोरुचितंयच्यहृद्विरुद्धं तदुच्यते। (च.सू. २६/१००)
२. संपद्विरुद्धं तद्विद्यादसंजातरसं तु यत्। (च.सू. २६/१००)
३. ज्ञेयं विधि विरुद्धं तु भुज्यते निभृते नयत्। (च.सू. २६/१००)
४. षाण्ड्यान्ध्यविसर्पदुकोदराणां विस्फोटकोन्मादभगन्दराणाम्। मूर्च्छामदाध्मानगलग्रहाणां पाण्ड्वामयस्यामविषस्य चैव।।
किलासकुष्ठग्रहणीगदानां शोधा म्लपित्तज्वरपीनसानाम्। सन्तानदोषस्य तथैव मृत्योर्विरुद्धमंत्रं प्रवदन्ति हेतुम्॥ (च.सू. २६/१००)

3. Use of antagonistic substances to subside the disease caused by viruddhahara.
4. Prior conditioning of the body with similar substance¹.

Food Poisoning

Food poisoning is any illness caused by eating food or drink that is contaminated with certain types of bacteria, parasites, viruses or toxins.

Food can Become Contaminated:

- When food is not prepared safely, including when meat is undercooked or lack of hand washing.
- When food is touched by someone who has gastroenteritis.
- By contact with pets, flies or other pests.
- When raw meat and ready to eat foods come into contact with each other.
- When food is stored at unsafe temperatures that allows bacteria to grow.
- When fruit, vegetables and eggs are contaminated with animal manure or water contaminated by animal manure.

Causes of Bacterial Gastroenteritis

The cause may be explained based on the following types:

1. Non-bacterial:

- It is caused by certain poisons of plant origin like Lathyrus sativus, poisonous mushrooms etc
- Poisons of animal origin like sea foods, etc.
- In recent years, there has been a growing concern about contamination of food by chemicals, e.g. fertilizers, pesticides, arsenic, cadmium and mercury etc.

2. Bacterial:

- It is caused by the ingestion of foods contaminated by living bacteria or their toxins.
- Numerous bacteria can cause gastroenteritis, including:
Yersinia found in pork, Staphylococcus found in dairy products, meat, and eggs, Shigella found in water, Salmonella found in meat, dairy products and eggs, E. coli found in ground beef and salads, Listeria found in chilled, ready-made foods like soft cheese, pre-packaged sandwiches, butter etc.
- Bacterial gastroenteritis can be easily transmitted from person to person if someone carries the bacteria on their hands.

१. एषां खलु अपरेषां च वैरोधिकनिमित्तानां व्याधीनामिसे भावाः प्रतिकारा भवन्ति तद्यथा वमनं विरेचनं च, तद्विरोधिनां च द्रव्याणां संशमनार्थमुपयोगः
तथाविधेश्च द्रव्यैः पूर्वमभिसंस्कारः शरीरस्येति। (च.सू. २६/१०४)

- Every time a person infected with these bacteria touches food, objects, or other people, they risk spreading the infection to others.

Types:

- The bacterial food poisoning is of 3 types:

1. Infection Type
2. Toxin Type
3. Botulism

1. INFECTION TYPE: (Inflammatory Diarrhea)

- It results from ingestion of viable micro-organisms that multiply in the GIT and produce infection.

Ex: Salmonella group of organisms.

Source:

- Salmonellosis is primarily a disease of animals.
- Humans contract the infection from farm animals and poultry – through contaminated meat, milk and milk products, sausages, custards, egg and egg products.
- Rats and mice are another source; they are often heavily infected and contaminate foodstuffs by their urine and feces.
- Temporary human carriers can also contribute to the problem.

Incubation Period:

About 12–24 hours, commonly.

Mechanism of Food Poisoning:

- The causative organisms, on ingestion, multiply in the intestine and give rise to acute enteritis and colitis.
- The onset is generally sudden with chills, fever, nausea, vomiting, and a profuse watery diarrhea which usually lasts for 2–3 days.
- The mortality rate is about 1 per cent.
- A convalescent carrier state lasting for several weeks may occur.

Signs and Symptoms:

- Nausea
- Vomiting
- Diarrhoea- persisting and foul smelling, stained with blood or mucus.

- Stomach pains or cramps
- Sweating, fever or chills
- Headache
- Lethargy (extreme tiredness).

2. TOXIN TYPE:(Non-inflammatory Diarrhea)

- It results from toxins produced by multiplying organisms that have gained access to the prepared food.
- Ex: Enterotoxins produced by staphylococcus.

Agent:

- Enterotoxins of Staphylococci, clostridium perfringens etc
- Toxins can be formed at optimum temperatures of 35°C to 37°C
- These toxins are relatively heat-stable and resist boiling for 30 minutes or more.

Source:

- Staphylococci are omnipresent in nature, and are found on the skin and in the nose and throat of men and animals.
- They are a common agent of boils and pyogenic infections of man and animals.
- Cows suffering from mastitis have been responsible for outbreaks of food poisoning involving milk and milk products.
- The foods involved are salads, custards, milk and milk products which get contaminated by staphylococci.

Incubation Period:

- It's about 1–6 hours.
- The incubation period is short because the “Preformed” toxins act directly on the intestine and CNS.

Signs and symptoms:

- Salivation.
- Diarrhea
- Nausea
- Abdominal cramps
- Vomiting

3. Botulism (Allantiasis):

It is most serious of all.

Agent:

Exotoxin of *Clostridium Botulinum* generally Type A, B, or E.

Source:

- The organism is widely distributed in soil, dust and the intestinal tract of animals and enters food as spores.
- The foods most frequently responsible for botulism are home preserved foods such as home-canned vegetables, smoked or pickled fish, home-made cheese and similar low acid foods.

Incubation Period:

About 12–30 hours.

Mechanism of Food Poisoning:

- The toxin inhibits acetylcholine and paralyzes the nerve endings by blocking the nerve impulses at the myoneural junctions.
- It affects the peripheral cholinergic nerve terminals including neuromuscular junctions, post-ganglionic parasympathetic nerve endings and peripheral ganglia without affecting the CNS.

Signs and Symptoms:

- Botulism differs from other forms of food poisoning in that the gastrointestinal symptoms are very slight and the prominent symptoms include:
- Dry mouth/throat
- Dysphagia
- Diplopia
- Ptosis
- Dysarthria
- Blurring of vision
- Muscle weakness
- Quadriplegia.
- Fever is generally absent, and consciousness is retained.
- The condition is frequently fatal, death occurring 4–8 days later due to respiratory or cardiac failure.

- Since the toxin is thermo labile, the heating of food which may be subjected to 100°C for a few minutes before use will make it quite safe for consumption.
- Botulism occurring in infants is called "Infantbotulism". It is due to infection of the gut by CI Botulinum with subsequent in vivo production of toxin.

- **Management:**

The treatment of Infection type and Toxin type of food poisoning include:

1. Administration of Gastric lavage and purgatives
 2. Glucose saline infusion to promote elimination of toxins from the systems.
 3. Antibiotics depending on the causative organism.
- Treatment of Botulism includes:
 1. Maintenance of ABC.
 2. Decontamination- Gastric lavage, purgatives etc.
 3. Anti-toxin – Polyvalent botulinum antitoxin (Types A,B,E)- 1 vial by slow IV in normal saline and 1 vial IM.
 4. Botulism immune globulin (BIG), 50 ml – IV till patient recovers.

Important Questions

Long Questions:

1. Describe in detail the concept of Dooshi Visha along with its contemporary relevance.
2. Describe Viruddhara as explained in the classics.

Short Essay:

1. Dooshi Visha.
2. Gara Visha.
3. Food poisoning.

Short Answers:

1. Dooshi vishari Gutika.
2. Moorvadi agada.

Jangama Visha

Definition:

दंष्ट्रिणो ये विषं तेषां दंष्ट्रोत्थं जङ्गमं मतम्। (च.चि. २३/१०)

Jangama visha deals with the poisonous symptoms and treatment of different animal poisoning, mainly the ones produced due to their bites.

The poison of serpents, insects, rats, spiders, scorpions, house lizards, leech, fishes, frogs, hornets, dogs, lions, tigers, jackals, hynas, mangoose and other fanged animals may be included under this.¹

सर्पलूतादि दंष्ट्रासु दारुणं जङ्गमं विषम्। (अ.ह.उ. ३५/४)

That poison which is powerful and present in the teeth of snakes, spiders etc is called jangama visha.¹

Jangama Visha Adhishtana [जङ्गम विष अधिष्ठान]:

Jangama visha adhishtanas are 16 in number. This has been explained previously.

Gati of Jangama Visha [जङ्गम विष गति]:

जङ्गमं स्यादधोभागं-----। (च.चि. २३/१७)

The gati of jangama visha is directed downwards.

Jangama Visha Samanya Lakshana [जङ्गम विष सामान्य लक्षण]:

निद्रां तन्द्रां क्लमं दाहं सपाकं लोमहर्षणम्। शोफं चैवातिसारं च जनयेजङ्गमं विषम्।। (च.चि. २३/१५)

The general signs and symptoms produced by jangama visha include sleep, drowsiness, exhaustion, burning sensation, inflammation, horripilation, oedema and diarrhoea.

Visha Vriddhi and Kshaya Karanas [विष वृद्धि-क्षय कारण]:

Vriddhi Karana [वृद्धिकारण]:

१. भीत मत्त अबल उष्ण क्षुत् तृषार्ते वर्धते विषम्।

विषं प्रकृति कालौ च तुल्यौ प्राप्य अल्पं अन्यथा।। (च.चि. २३/१६२)

Poison gets aggravated in persons who are afraid, drunken, weak, afflicted with heat,

१. सर्पाः कीटोन्दुरा लूता वृश्चिका गृहगोधिकाः। जलौका मत्स्य मण्डूकाः कणभाः सकृकण्टकाः॥
श्वसिंहव्याघ्रगोमायु तरक्षु नकुलादयः। दंष्ट्रिणो ये विषं तेषां दंष्ट्रोत्थं जङ्गमं मतम् ॥ (च.चि. २३/९-१०)

hunger, thirst and also if the body constitution and time are similar to that of visha (like pitta prakriti and ushna kāla)¹. In the rest, it has mild effect.

२. अजीर्ण पित्तातप पीडितेषु बाल प्रमेहिष्वथ गर्भिणीषु।

वृद्ध आतुर क्षीण बुभुक्षितेषु रुक्षेषु भीरुषु अथ दुर्दिनेषु।। (सु.क. ३/३९)

Poison is powerful or it increases in those having indigestion, suffering from increase of pitta dosha, in sunlight, in children, in diabetics, pregnant woman, old person, sick, persons who are emaciated, hungry, dry, and fearful and when bitten on a cloudy day.

३. श्मशान चैत्य वल्मीक यज्ञ आश्रम सुरालये।

पक्षसन्धिषु मध्याह्ने सार्धरात्रे अष्टमीषु च।। (च.चि. २३/१५९)

The person bitten in the following regions do not recover:

श्मशान	-	cremation grounds
चैत्य	-	religious/sacred tree
वल्मीक	-	ant hill
यज्ञाश्रम	-	sacrifices hermitage
सुरालय	-	temple
पक्षसन्धि	-	on the last days of a fortnight
मध्याह्न	-	noon
अर्धरात्रि	-	mid night
अष्टमी	-	on 8 th day of a fortnight
नवमी	-	9 th day of a fortnight
पञ्चमी	-	5 th day of a fortnight
सन्ध्या	-	evenings

Apart from the above, bites in the stellar constellations like yama, agneya, magha, ashlesha and vishaka, in poorna or nairuta direction, in nairuta muhurtha and when bitten in marmasthana should be rejected as there is excess visha vriddhi in these.²

4. The trouble by a poison increases due to hunger, thirst, increase of heat, general debility, anger, grief, fear, fatigue, indigestion, watery stools, increase of pitta and vata, by the smell of tila flowers and fruits and fumes from earth, hearing of thunder, trumpeting an

१. प्रकृति कालौ तुल्यौ विषस्य, यथा प्रबल पित्त प्रकृति उष्णश्च काल इति ज्ञेयम्।

(चक्रपाणि दह च.चि. २३/१६२)

२. श्मशान चिति चैत्यादौ पञ्चमी पक्षसन्धिषु। अष्टमी नवमी सन्ध्या मध्याह्ने दिनेषु च॥

याम्याग्रेय मद्य आश्लेष विशाखा पूर्व नैर्ऋते। नैर्ऋताग्रे मुहुते च दष्टं मर्मसु च त्यजेत्॥ (अ.सं.उ.४१/४९)

elephant, squeaking of a mice, sound of musical instrument, during visha sankata, in the eastern breeze and by sexual activities.¹

५. वर्षासु च अम्बु योनित्वात् संक्लेदं गुडवद्वतम् विसर्पति..... । (अ.सं.उ. ४१/८६)
- Poison being born from water becomes highly moist like jaggery during rainy season and spreads throughout the body.

Visha Kshaya Karana [विष क्षय कारण]:

The following are the visha kshaya karanas specifically in snakes.

जलाप्लुता रतिक्षीण भीत नकुलनिर्जिताः । शीतवातातप व्याधि क्षुत् तृष्णा श्रम पीडिताः । ।

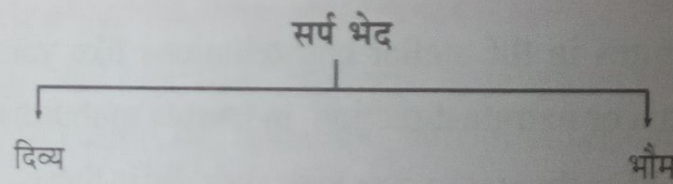
तूर्ण देशान्तरायाता विमुक्त विषकञ्चुकाः । कुशौषधी कण्टकवद्ये चरन्ति च काननम् ।

देशं च विद्याध्युषितं सर्पास्तेऽल्पविषा मताः । । (अ.सं.उ. ४१/४७)

Snakes drenched in water (जलाप्लुता) debilitated by copulation, (रतिक्षीण) frightened (भीत), defeated by mongoose (नकुलनिर्जिता), distressed by cold breeze (शीतवात), sunlight, disease, hunger, thirst, fatigue, soon after coming from a different region (तूर्ण देशान्तरायाता) soon after shedding off its peel/moulting, in snakes which wander in the forest full of kusa grass, medicinal plants, thorny vegetation and cultivated regions-possess little poison or are considered to be mildly poisonous.

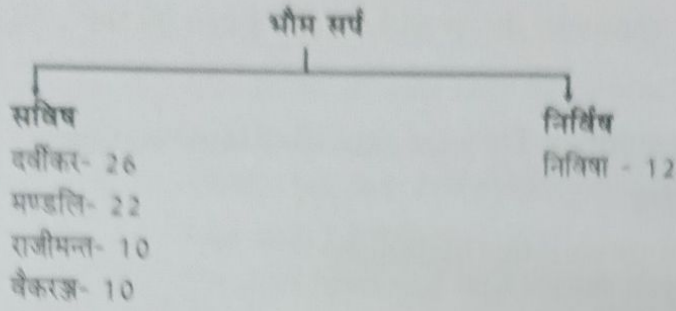
Bite by a snake which is diseased, when in emotions, when very old or very young in age is said to be having less poison; when bite happens at places inhabited by suparna (garuda-red eagle), Devas (Gods) brahmarsi (divine sages), yaksas and siddhas (divine spirits) and at places having antipoisonous plants, poison does not spread, or is of less potency².

I) Sarpa Bheda:

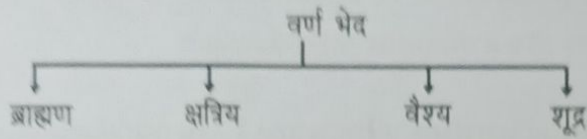


१. क्षुत् तृष्णा घर्म्म दौर्बल्य क्रोध शोक भय श्रमः । अजीर्ण वचो द्रवता पित्त मारुत वृद्धिभिः ॥
तिल पुष्प फलाग्राण भू बाष्प घन गर्जितैः । हस्ति मूषिक वादित्र निस्वनैर्विष सङ्कटैः ॥
पुरो वातोत्पलामोद मदनैर्वर्धते विषम् ॥ (अ.सं.उ. ४१/८५)
२. व्याधितोद्विग्न दष्टानि ज्ञेयान्यल्प विषाणि तु ।
तथा अति वृद्ध बालाभिदष्टम् अल्पविषं स्मृतम् ॥
सुपर्णदेव ब्रह्म ऋषि यज्ञ सिद्ध निषेविते ।
विषघ्नौषधि युक्ते च देशे न क्रमते विषम् ॥ (सु.क. ४/२०-२१)

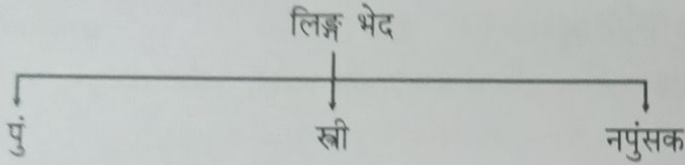
II) Classification of Bhauma Sarpa :



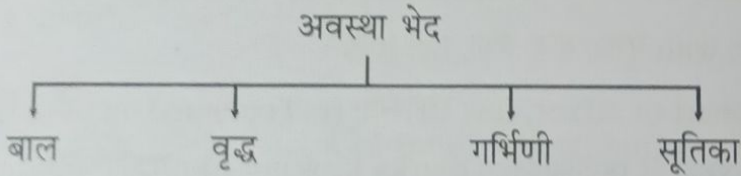
III) Classification Based on Varna:



IV) Classification Based on Linga:



V) Classification Based on Avastha:



i) दिव्य-भौम सर्पः

दिव्य भौम विभागेन द्विविधाः पन्नगाः स्मृताः ।। (अ.सं.उ. ४१/२)

The snakes are mainly classified into 2 types, divya and bhauma.

दिव्य सर्पः— These are 7 in number

वासुकि, तक्षक, अनन्त, सगर, सागरालय, नन्द, उपनन्द ।

The Divya sarpas are radiant just like fire. They have the following features¹.

गर्जन्ति	-	always roar.
वर्षन्ति	-	are responsible for rainfall
द्योतन्ते	-	Shine by themselves.
द्योतयन्ति	-	make others to shine.
धारयन्ति जगत् कृत्स्नं	-	always support and sustain the world

१. दिव्य भौम विभागेन द्विविधाः पन्नगाः स्मृताः । वासुकि तक्षकोऽनन्त सगरः सागरालयः ।।
तथा नन्दोपनन्दाद्याः समिद्धाग्नि समप्रभाः । दिव्या गर्जन्ति वर्षन्ति द्योतन्ते द्योतयन्ति ते ।।
धारयन्ति जगत्कृत्स्नं कुर्युः क्रुद्धाश्च भस्मसात् । दृक्निश्चासैर्नमस्तेभ्यो न तोष्वस्ति चिकित्सितम् ।।

कृद्धाश्च भस्मसात्

when they become angry, they will
convert the world to ashes just by their sight.

II) भौम सर्पः

The Bhouma sarpa are 80 in number. They are classified into two types.¹

(a) Savisha (b) Nirvisha

Savisha sarpa are the poisonous varieties including-

Darveekara - 26

Mandali - 22

Rajeeman - 10

Vaikaranja - 7+3 = 10

Nirvisha sarpa are the non-poisonous varieties which are 12 in number.

III) वर्ण भेदेन सर्पाः

Classification of snakes based on वर्ण/Race:-

According to the varna, snakes are classified as brahmana, kshatreeya, vaishya and shudra.

a) ब्राह्मण सर्पः^{२,३}

वर्ण/colour:	नील-blue, कपिला: श्वेतलोहिता: Bluish-brown or whitish-red in colour.
स्वरूप/	क्रोधन- In anger, with मुक्ता/रुप्य प्रभा, i.e. it is
Appearance:	bright like a pearl or silver, has रक्तास्या: (red coloured mouth). पिङ्गनयना: or brownish eyes. It possesses marks looking like यज्ञोपवित/sacrificial thread on hood.
गन्ध:	Emits smell like the flowers of bilwa, chandana, usheera, padma, guggulu etc.
संचार काल ^४ :	It moves about in clean places in daytime/पूर्वाह्न (i.e. bites mainly in पूर्वाह्न).
दोष प्रकोप ^५ :	त्रिदोष

१. अशीतिस्त्वेव सर्पाणां भिद्यते पञ्चधा तु सा । दर्वीकरा मण्डलिनो राजिमन्तस्तथैव च॥
निर्विषा वैकरञ्चश्च त्रिविधास्ते पुनः स्मृताः । दर्वीकरा मण्डलिनो राजिमन्तश्च पन्नगाः॥
तेषु दर्वीकरा ज्ञेया विंशतिः षट् च पन्नगाः । द्वाविंशतिर्मण्डलिनो राजिमन्तस्तथा दश॥
निर्विषा द्वादश ज्ञेया वैकरञ्चास्त्रयस्तथा । वैकरञ्जोद्भवाः सप्त चित्रा मण्डलि राजिलाः॥ (सु.क. ४/९-१२)

२. ब्राह्मणाः क्रोधना नीलकपिलाः श्वेत लोहिताः । रक्तास्याः पिङ्गनयना मेध्यदेश विचारिणः ॥
भोगे यज्ञोपवीतादि द्विजचिह्नोपचिह्निताः । बिल्वपुष्प हिमोशीरपध्मगुगुलु गन्धयः॥ (अ.सं.उ. ४१/१८)

३. मुक्ता रुप्य प्रभा ये च कपिला ये च पन्नगाः । सुगन्धयः सुवर्णाभास्ते जात्या ब्राह्मणाः स्मृताः॥ (सु.क. ४/२५)

४. पूर्वाह्ने ब्राह्मणाश्चरन्ति दशनाया । (इन्दु दह अ.सं.उ. ४१/२२)

५. ब्राह्मणास्त्रीनपि दोषान् कोपयन्ति॥ (इन्दु दह अ.सं.उ. ४१/२४)

(b) क्षत्रिय सर्पः^{१,१}

वर्णः	-	स्निग्ध वर्ण Colour like पक्व जाम्बव, खर्जूर द्राक्षा, भिन्न अंजन प्रभा Colour like those of ripe fruit of jambu, kharjura, draksha and broken anjana lump.
स्वरूप-	-	रक्ताक्ष - possess red eyes.
	-	Get angry soon.
	-	Possess marks of half moon srivatsa gem, conch, wheel or plough on hood.
गंध	-	Emits smell of jati, champaka, punnaga, nagakesara, tejapatra etc from its body.
संचार काल ^१	-	मध्याह्न
दोष प्रकोप ^१	-	Vata

(c) वैश्य सर्पः^{१,१}

वर्णः/colour	-	पारावताभासा - Which possess colour like a pigeon.
	-	वज्र- गोमेदक प्रभा: lustre like diamond or gomedaka.
स्वरूप	-	Covered with dots or patch of colour of smoke or red in colour.
गंध	-	Emits smell like that of goat, kusta, sheeps milk and ghee.
संचार काल ^१	-	अपराह्न
दोष प्रकोप ^१	-	Pitta

(d) शूद्र सर्पः

वर्णः/Colour ^{१,१०}	-	Colour of wheat, buffalo, elephant or leopard.
स्वरूपः/Appearance-	-	Have dots or lines on the body and dry or rough skin.
गंध ^{११}	-	Emits smell of beer (sura) or blood (shonita)
संचार काल ^{१२}	-	After sunset
दोष प्रकोप ^{१३}	-	Kapha

१. क्षत्रिया मानिनो धीरा रक्ताक्ष भृशकोपनाः । पक्वजाम्बव खर्जूर द्राक्षा भिन्नाञ्जन प्रभाः॥
भोगेऽर्द्ध चन्द्र श्रीवत्स शङ्ख चक्र हलाङ्किताः । जाति चम्पक पुन्नागपत्र जोङ्गक गन्धयः॥ (अ.सं.उ. ४१/९)
२. क्षत्रियाः स्निग्धवर्णास्तु पन्नगाः भृशकोपनाः । सूर्यचन्द्राकृति च्छत्रलक्ष्मा तेषां तथाऽम्बुजम्॥ (सु.क. ४/२६)
३. मध्याह्ने क्षत्रियाः । (इन्दु दह अ.सं.उ. ४१/२२)
४. क्षत्रियोऽनिलं.... । (इन्दु दह अ.सं.उ. ४१/२४)
५. वैश्याः पारावताभासा वज्र गोमेदकप्रभाः । बिन्दुमण्डल चित्राङ्गा धूम्रपाटल लोहिताः॥वस्तुकुष्ठाविकक्षीरसर्पिषां गन्धतः समाः॥ (अ.सं.उ. ४१/२०)
६. कृष्णा वज्रनिभा ये च लोहिता वर्णतस्तथा। धूम्राः पारावताभाश्च वेश्यास्ते पन्नगाः स्मृताः॥ (सु.क. ४१/२७)
७. अपराह्ने वैश्याः॥ (इन्दु दह अ.सं.उ. ४१/२२)
८. वैश्यः पित्तं.... । (इन्दु दह अ.सं.उ. ४१/२४)
९. शूद्राः सवर्णा गोधूम महिष द्विप कर्दमैः । बिन्दु रेखाचिता रुक्षाः..... (अ.सं.उ. ४१/२१)
१०. महिष द्वीपि वर्णाभास्तथैव परुषत्वचः । भिन्नवर्णाश्च ये केचिच्छूद्रास्ते परिकीर्तिताः॥ (सु.क. ४/२८)
११. सुराशोणित गन्धयः॥ (अ.सं.उ. ४१/२१)
१२. अस्तङ्गते रवौ शूद्राः..... । (अ.सं.उ. ४१/२२)
१३. शूद्रः कफम् । (इन्दु दह अ.सं.उ. ४१/२४)

(IV) Classification of Snakes Based on Gender: लिङ्ग भेदेन सर्पाः

Based on the gender the snakes are classified as पुरुष (male), स्त्री (female) or नपुंसक (Eunuchs)

पुरुष सर्प/नर सर्पः^{१,२,३}

ऊर्ध्व दृङ् - upward gaze

महाकाय नेत्र जिह्वा शिरः स्वरः - Big body, eyes, tongue, head, voice (loud)

These are धीर (Bold) and व्यक्त भोगः (with a perceivable hood) or वृत्त भोगोः Rounded hood, when bitten by a male snake patient looks upwards^४.

स्त्री सर्प/नारी सर्पः^{५,६,७}

- These snakes possess opposite qualities of male snakes.
- They are unsteady in action.
- Possess सूक्ष्म नेत्र जिह्वा आस्य शिरस्
- If bitten by female snake, the patient looks downward.^८

Fangs of Snake - सर्पदंष्ट्राः

The snakes have four fangs. Of these the lower left one is white in colour, the upper left one is yellow in colour, the lower right is red and the upper right is brownish in colour.^९

Apart from these four fangs there are forty four number of teeth in snakes, which are not poisonous.^{१०}

Quantity of Poison:

The quantity of poison contained in the lower left fang is equal to the number of drops which fall from the hair of the tail of a cow when it is dipped in water and then lifted up. The poison contained in the upper left, lower right and upper right fang is respectively double, three time and four times of the poison contained in the lower left fang.^{११}

१. वृत्तभोगो महाकायः श्वसन्नृध्वेक्षणः पुमान् । स्थूल मूर्धा समाङ्गाश्च। (च.चि. २३/१३०)
२. तत्र महानेत्र जिह्वा आस्य शिरसः पुमांसः। (सु.क. ४/३५)
३. तत्र ऊर्ध्व दृङ् महाकाय नेत्र जिह्वा शिरः स्वरः । व्यक्त भोगः पुमान् धीरः। (अ.सं.उ. ४१/१६)
४. पुरुषाभिदष्ट उर्ध्व प्रेक्षते.....। (सु.क. ४/३८)
५.स्त्री त्वतः स्याद्विपर्ययात्। (च.चि. २३/१३१)
६. सूक्ष्म नेत्र जिह्वास्य शिरसः स्त्रियः.....। (सु.क. ४/३५)
७. स्त्री स्यात्तस्माद्विपर्यये.....। (अ.सं.उ. ४१/१६)
८.अधस्तात् स्त्रिया सिराश्चोत्तिष्ठन्ति ललाटे.....। (सु.क. ४/३८)
९. सर्पदंष्ट्राश्चतस्रस्तु तासां वामाधरा सिता ।
पीता वामोत्तरा दंष्ट्रा रक्तश्यावा अधरोत्तराः॥ (च.चि. २३/१३७)
१०. विद्यादंष्ट्रास्तथापराः । चत्वारिंशद् भुजङ्गस्य निर्विषाश्चतुरुत्तराः॥ (अ.सं.उ. ४१/१८)
११. यन्मात्रः पतते बिन्दुर्गोवालात् सलिलोदृतम् । वामाधरायां दंष्ट्रायां तन्मात्रं स्यादहेर्विषम्॥
एक द्वि त्रि चतुर्वृद्ध विषभागोत्तरोत्तराः । सवर्णास्तत्कृता दंशा बहूत्तरविषा भृशाः॥ (च.चि. २३/१३८-३९)

Reasons for a Snake Bite - (सर्प दष्ट कारण):

आहारार्थं भयात् पादस्पर्शादतिविषात् क्रुधः । पापवृत्ततया वैराहेवर्षियम चोदनात् । ।

दशान्ति सर्पास्तेषूक्तं विषाधिक्यं यथोत्तरम् । । (अ.सं.उ. ४१/३३)

The snakes bite for the purpose of food, by fear, being touched by the feet, accumulation of more poison (in their body), anger, committing of sinful acts (by man etc), by hatred and instigation by gods, sages and yama (lord of death). The effect of poison is more predominant in each succeeding one.

Acharya sushruta opines that the snakes when trampled by the feet, those which are cruel by nature, which are enraged or angry, which are in search of food and which are very angry or ferocious- these bite others.¹

सर्प दंश प्रकार (Varities of Snake Bite)

सुश्रुत (3 types)

१. सर्पित
२. रदित
३. निर्विष

वाग्भट (5 types)

१. तुण्डाहत
२. व्यालीढ
३. व्यालुप्त
४. दष्टक
५. दष्टनिपीडित

“सर्पितं रदितं चापि तृतीयमथ निर्विषम् । सर्पाङ्गभिहतं केचिद्विच्छन्ति खलु तद्विदः । । (सु.क. ४/१४)

Snake bite is of 3 kinds.

१. सर्पित, २. रदित, ३. निर्विष

Some authorities have included सर्पाङ्गभिहत as the fourth kind.

i. सर्पित (Deep Poisonous Bite):

- पदानि यत्र दन्तानामेकं द्वे वा: Two or more marks of teeth are visible.
- निमग्नान्यल्परक्तानि: Which are deep and with little quantity of blood coming out.
- चञ्चुमालकयुक्तानि: Which when squeezed gives rise to development of sprout like eruptions.
- वैकल्यकरणानि: Creates abnormalities.
- संक्षिप्तानि: Are minute
- सशोफानि: Associated with swelling².

१. पादाभिमृष्टा दुष्टा वा क्रुद्धा आसार्थिनोऽपि वा । ते दशन्ति महाक्रोधास्त्रिविधं भीम दर्शनाः ॥ (सु.क. ४/१३)

२. “पदानि यत्र दन्तानामेकं वा बहूनि वा । निमग्नान्यल्परक्तानि यान्युद्धृत्य करोति हि ॥

चञ्चुमालयुक्तानि वैकल्यकरणानि च । संक्षिप्तानि सशोफानि विद्यात्तत् सर्पितं भिषक् ॥ (सु.क. ३/१४)

ii. रदित (Lacerated Bite):

- राज्यः सलोहित यत्र नीलाः पीताः सिताः Presence of lines which are bluish red, yellow or white.
- अल्पविषं : Less amount of poison¹

iii. निर्विष (Poison Free Bite):

- अशोफः No swelling.
- अल्पदुष्टसृक् Little amount of vitiated blood.
- प्रकृतिस्थस्य देहिनः Bitten by a snake which is normal (not angry, hungry etc).
- पदं पदानि वाः Marks of one bite or many visible marks at the site of bite.
- विद्यादविषं : No poison².

iv. सर्पाङ्गाभिहतः

- भीरोहि सर्पसंस्पर्शात् भयेन कुपितोऽनिलः In persons who are afraid, vata is aggravated by fear following touch by snake, giving rise to-
- शोफः Swelling.

Here there is no history of bite from a snake³.

आचार्य वाग्भट has Explained 5 Types दंष्ट्राः

- | | |
|----------------|------------|
| १. तुण्डाहत | २. व्यालीढ |
| ३. व्यालुप्त | ४. दष्टक |
| ५. दष्टनिपीडित | |

१. तुण्डाहतः

- “यत्र लाल परिक्लेद मात्रं गात्रे प्रदृश्यते।
“न तु दंष्ट्राकृतं दंशं तत्तुण्डाहतमादिशेत्।।” (अ.ह.उ. ३५/११)
- लाल परिक्लेद मात्रं : Body is wet by the deposit of saliva.
- न तु दंष्ट्राकृतः No marks of teeth/no bite of snake only rubbed by its mouth.

२. व्यालीढः

“एकं दंष्ट्रापदं द्वे वा व्यालीढाख्यमशोणितम्।” (अ.ह.उ. ३५/१२)

- एकं दंष्ट्रापदं द्वे वाः One or two marks of teeth
- अशोणितम् : No bleeding

३. व्यालुप्तः

“दंष्ट्रापदे स रक्ते द्वे व्यालुप्तं।” (अ.ह.उ. ३५/१२)

१. राज्यः सलोहित यत्र नीलाः पीताः सितास्तथा । विद्वेयः रदितं तत्तु ज्ञेयमल्पविषं च तत्॥ (सु.क. ३/१६)
 २. “अशोफमल्पदुष्टसृक् प्रकृतिस्थस्य देहिनः । पदं पदानि वा विद्यादविषं तच्चिकित्सकः ॥” (सु.क. ३/१८)
 ३. “सर्पस्पर्शस्य भीरोहि भयेन कुपितोऽनिलः । कस्यचित् कुरुते शोफं सर्पाङ्गाभिहतं तु तत्॥” (सु.क. ३/१९)

- दंष्ट्रपदे द्वे: Marks of two teeth seen.
- सरक्ते: Along with bleeding.

४. दष्टकः

“.....त्रिणी तानि तु।

मांसच्छेदात् अविच्छिन्न रक्तवाहीनि दष्टकम्।।” (अ.ह.उ. ३५/१३)

- त्रिणी तानि तु: Three marks of teeth of the snake are seen.
- मांसच्छेदात् अविच्छिन्न रक्तवाहिनि: Tearing away of muscles and blood vessels takes place.

५. दष्टनिपीडितः

“दंष्ट्रा पदानि चत्वारि तद्वदष्टनिपीडितम्।”

- दंष्ट्रा पदानि चत्वारि: Four teeth marks are seen.
- तद्वदष्टनिपीडितः Other features similar to dastaka.

i.	सर्पित	रदित	निर्विष
१.	दन्तानामेकं द्वे	१.राज्यः स लोहित यत्र नीलाः	१.अशोफ
२.	अल्परक्तानि	पीताः सितास्तथा	२.अल्परक्त
३.	सशोफानि	२.अल्पविष	३.अविष
४.	चञ्चुमालक युक्तानि		
५.	वैकल्यकरणानि		
६.	संक्षिप्तानि		

ii.	तुण्डाहत	व्यालीढ	व्यालुप्त	दष्टक	दष्टनिपीडित
१.	लालपरिक्लेद मात्रं	१.एकं दंष्ट्रपदं द्वे वा	१.दंष्ट्रपदे द्वे	१.त्रिणी	१. दंष्ट्रपदानि चत्वारि
२.	न तु दंष्ट्रकृत्	२.अशोणितम्	२.सरक्ते	२.मांसच्छेद ३.अविच्छिन्न रक्तवाहिनि:	२. Other feat ures similar to दष्टक

दर्वीकर सर्प लक्षण- Identification of Darveekara Sarpa:

रथाङ्ग लाङ्गल च्छत्र स्वस्तिक अङ्कुश धारिणः। ज्ञेया दर्वीकराः सर्पाः फणिनः शीघ्र गामिनः।। (सु.क. ४/२२)

Snake which make a phana/hood on it with marks resembling a wheel, plough, umbrella, swastika and ankusā (elephants goad) and which move fast are known as darveekara sarpa or hooded snake.

Number/Types— Darveekara sarpa are 26 in number.¹

- They cause aggravation of vata dosa.²
- They move about during the day time.³
- They are powerful or potent in tarunavastha or young age and therefore cause death.⁴
- Their poison is dry and pungent.⁵

दर्वीकर सर्पदंश सामान्य लक्षणः

General Signs and Symptoms of Bite by Darveekara Sarpa:

In general, the signs and symptoms of bite by a darveekara sarpa include the following⁶:-

कूर्मपृष्ठोन्नतो	- Site of bite is elevated like the tortoise back.
रुक्ष	- Dry
सूक्ष्मदंष्ट्रापदान्वितः	- with small marks of teeth.
विकाराः श्यावता वक्त्र	- associated with abnormal symptoms
नख मूत्र अक्षि विट् त्वचा-	such as blue colour of the face, nails, urine, eye, faeces and skin.
शीत ज्वर	- fever with rigors.
सन्धि रुजा	- pain in the joints
निद्रानाश	- loss of sleep
विजृम्भिका	- more of yawning
मन्यास्तम्भ	- rigidity of the neck
सिराध्मानं	- distention of the veins
पृष्ठ कटि अस्थि ग्रहा	- pain of the bones of back and waist
वाग्ग्रहा	- loss of speech

१. तेषु दर्वीकरा ज्ञेया विंशतिः षट् च पन्नगाः। (सु.क. ४/९-१२)

२. कोपयन्त्यनिलं जन्तोः फणिनः सर्व एव तु॥ (सु.क. ४/२९)

३.दिवा दर्वीकराः स्मृताः॥ (सु.क. ४/३१)

४. दर्वीकरास्तु तरुणा.....। (सु.क. ४/३२)

५. विशेषाद्रुक्ष कटुक.....। (अ.सं.उ. ४१/६)

६.तत्र दंशः फणावताम् । कूर्मपृष्ठोन्नतो रुक्षः सूक्ष्मदंष्ट्रापदान्वितः ॥

विकाराः श्यावतावक्त्रनखमूत्राक्षिविट्त्वचाम् । शीतज्वरः सन्धिरुजा निद्रानाशो विजृम्भिका ॥

मन्यास्तम्भः सिराध्मानं पृष्ठकट्यस्थिवाग्ग्रहाः । शिरोगुरुत्वमरुचिः कासश्वासौ हनुग्रहः ॥

शूलमृद्वेष्टनं कोष्ठे शोषरोधौ मलाश्रयौ । सन्दिग्धवाक्त्वं नैश्चेष्ट्यं मृतस्येव विसंज्ञता ॥

फेनलालोद्गमौ हिष्मा कण्ठे घुरघुरायणम् । शुष्कोद्गारो मुहुश्चैते वातजाश्चापरे गदाः ॥ (अ.सं. ४१/३६)

शिरोगुरुत्वम्	- heavyness of the head.
अरुचिः	- anorexia
कास श्वासौ	- cough, dyspnoea
अनुग्रहः	- stiffness of the lower jaw
शूलमुद्धेष्टनं कोष्ठे	- pain and twisting movement inside the abdomen
शोषरोधौ मलाश्रयौ	- dryness and obstruction of the rectum
सन्दिग्ध वाक्त्वं	- irrelevant speech
नैश्चेष्ट्यं	- loss of movements
मृतस्येव विसंज्ञता	- loss of consciousness just like a dead man.
फेनलालोद्गमौ	- appearance of froth and saliva at the mouth.
हिध्मा	- hiccup
कण्ठे घुरुघुरायणम्	- rumbling sound in the throat
शुष्कोद्गारो मुहुस्ते	- dry belchings often
वातजाश्च अपरे गदाः	- other such symptoms of aggravation of vata.

Other symptoms apart from the above as explained in sushruta samhita include.¹

वेपथुः	- shivering
स्वरावसादो	- feeble voice
जड़ता	- lassitude
वायोरुर्ध्वगमनं	- upward movement of vata
तृष्णा	- thirst
स्रोतोऽवरोध	- blockage of channels.

दवीकर विषवेग लक्षण एवं चिकित्सा:

वेग	धातु	लक्षण	चिकित्सा
प्रथम	रक्तधातु	कृष्णता-Blackish discolouration of blood.	रक्तमोक्षण- blood letting
		काष्ण्य- Black discolour-	अगद पान with

१. तत्र, दवीकरविषेण त्वङ्गयन नख दशन वदन मूत्र पुरीष दंश कृष्णत्वं रौक्ष्यं शिरसो गौरवं सन्धिवेदना कटी पृष्ठ ग्रीवादौर्बल्यं जृम्भणं वेपथुः स्वरावसादो घुर्घुरको जड़ता शुष्कोद्गारः कास श्वासौ हिक्का वायोरुर्ध्वगमनं शूलोद्धेष्टनं तृष्णा लालास्रावः फेनागमनं स्रोतोऽवरोधस्ताश्च वातवेदना भवन्ति। (सु.क. ४/३७)

वेग	धातु	लक्षण ^{१,२}	चिकित्सा
		ration of body. पिपीलिका परिसर्पण-as if ants are crawling on the body. श्याव असृक्- blue coloured blood. श्यावता वक्त्रादौ- blue discolouration of face etc. सर्पन्तीव च कीटकाः-as if insects are moving all over the body.	मधु (honey) and सर्पि (ghee)
द्वितीय	मांस धातु	अत्यर्थ कृष्णता- profound blackish discolouration of the body. शोफ- edema, ग्रन्थि- tumour	वमन - emesis अगद पान with मधु सर्पि
तृतीय	मेद धातु	दंशक्लेद- moistness in the site of bite. शिरोगौरव- heavyness of head स्वेद - Sweating चक्षुग्रहण- loss of movement of eyeball. दृग्रोधो- loss of vision	नस्य- nasal medicine अञ्जन- eye salves with antipoisounous drugs.
चतुर्थ	कोष्ठ and vitiates कफ दोष	तन्द्रा - drowsiness प्रसेक - more salivation. सन्धिविश्लेषण - loosening of joints. ष्ठीवन - expectoration वमि - vomiting	वमन -emesis, यवागु - thick gruel is given.

१. तत्र दर्वीकराणां प्रथमे वेगे विषं शोणितं दूषयति, तत् प्रदुष्टं कृष्णतामुपैति, तेन काष्ण्यं पिपीलिका परिसर्पणमिव चाङ्गे भवति, द्वितीये मांस दूषयति, तेनाथ्यर्थं कृष्णता शोफो ग्रन्थ्यश्चाङ्गे भवन्ति, तृतीये मेदो दूषयति, तेन दंशक्लेदः शिरोगौरवं स्वेद चक्षुग्रहणं च; चतुर्थे कोष्ठमनुप्रविश्य कफ प्रधानान् दोषान् दूषयति, तेन तन्द्रा प्रसेक सन्धि विश्लेष भवन्ति, पञ्चमे अस्थीन्यनुप्रविशति प्राणमग्निं च दूषयति, तेन पर्वभेदो हिक्का दाहश्च भवति, षष्ठे मज्जानमनुप्रविशति ग्रहणीं चात्यर्थं दूषयति, तेन गात्राणां गौरवमतीसारो हृत्पीडा मूर्च्छा च भवति; सप्तमे शुक्रमनुप्रविशति व्यानं चात्यर्थं कोपयति कफं च सूक्ष्मस्रोतोभ्यः प्रच्यावयति, तेन श्लेष्म वर्ति प्रादुर्भावः कटीपृष्ठभङ्गः सर्वचेष्टा विधातो लाला स्वेदयोरति प्रवृत्ति रुच्छ्वास निरोधश्च भवति। (सु.क. ४/३९)
२. दर्वीकृताथ दष्टस्य दुष्टं श्यावी भवत्यसृक् । श्यावता तेन वक्त्रादौ सर्पन्तीव च कीटकाः॥
द्वितीये ग्रन्थयो वेगे तृतीये मूर्द्धगौरवम् । हृग्रोधो दंशक्लेदश्चतुर्थे ष्ठीवनं वमिः।
सन्धिविश्लेषणं तन्द्रा पञ्चमो पर्वभेदनम् । दाहो हिक्का च षष्ठे तु हृत्पीडा गात्र गौरवम्।
मूर्च्छाऽविपाकोऽतीसारः प्राप्य शुक्रन्तु सप्तमे । स्कन्धपृष्ठकटीभङ्गः सर्वचेष्टानिर्वर्तनम्॥(अ.सं.उ.४१/६०-६१)

वेग	धातु	लक्षण	चिकित्सा ^{१,२}
पञ्चम	अस्थि and vitiates प्राण वात and अग्नि	पर्व भेद - pain in the joints हिक्का - hiccup दाह - burning sensation.	शीतोपचार तीक्ष्ण शोधन तीक्ष्ण वमन यवागु पान
षष्ठ	मज्ज and vitiates ग्रहणि (duodenum)	गात्राणा गौरव - heavyness of body मूर्च्छा - fainting अतिसार - diarrhoea हृत्पीडा - heart pain अविपाक - indigestion	शीतोपचार तीक्ष्ण शोधन यवागु पान
सप्तम	शुक्र धातु, vitiates व्यान वात and elimi- nates कफ from सूक्ष्म स्रोतस्	श्लेष्मवर्तिप्रादुर्भाव - appearance of wicks of कफ in the channels. कटीपृष्ठभङ्ग - cutting pain in waist and back. सर्वचेष्टाविघात - loss of all movements. more elimination of लाला- saliva, स्वेद sweat, उच्छवास निरोध obstruction of expiration स्कन्ध भङ्ग Bending of shoulders	शिरोशोधन तीक्ष्ण नस्य and अञ्जन काकापाद

मण्डली सर्प लक्षणः (Identification of Mandali Sarpa):

मण्डलैः विविधैश्चित्राः पृथवो मन्दगामिनः । ज्ञेया मण्डलिनः सर्पा ज्वलनार्क समप्रभाः ।। (सु.क. ४/२३)

Snakes which have patches of different kinds (shapes) on their body, which are big in size,

- फणिनां विषवेगे तु प्रथमे शोणितं हरेत् । द्वितीये मधुसर्पिभ्यां पाययेतागदं भिषक् ।।
नस्य कर्म अञ्जने युज्यात् तृतीये विषनाशने । वान्तं चतुर्थे पूर्वोक्तां यवागूमथ दापयेत् ।
शीतोपचारं कृत्वाऽऽदौ भिषक् पञ्चम षष्ठयोः ।। पाययेच्छोधनं तीक्ष्णं यवागूं चापि कीर्तिताम् ।।
सप्तमे त्वपीडेन शिरस्तीक्ष्णेन शोधयेत् । तीक्ष्णमेवाञ्जनं दद्यात् तीक्ष्ण शस्त्रेण मूर्ध्नि च ।
कृत्वा काकपदं चर्म सासृग्वा पिशितं क्षिपेत् । (सु.क. ५/२०-२३)
- अथ दर्वीकृता वेगे पूर्व विस्त्राव्य शोणितम् । अगदं मधुसर्पिभ्यां संयुक्तं त्वरितं पिबेत् ।
द्वितीये वमनं कृत्वा तद् वदेवागदं पिबेत् । विषापहे प्रयुञ्जीत तृतीयेष्टञ्जननावते ।
पिबेच्चतुर्थे पूर्वोक्ता यवागूं वमनं कृते । षष्ठपञ्चमयोः शीतेर्दिग्धसिक्तमभीक्ष्णशः ।
पाययेदवमनं तीक्ष्णं यवागूं च यथोदिताम् । अगदं सप्तमे तीक्ष्णं युज्यादञ्जननस्ययोः ।
कृत्वासगादं शस्त्रेण मुर्ध्नि काकपदं ततः । मांस सरुधिरं तस्य चर्म वा तत्र निक्षिपेत् ।। (अ.सं.उ. ४२/६९-७३)

which move slowly, are known as Mandali (patched snake) and are like fire and sun (in effect of their poison).

- They are 22 in number.¹
- They cause aggravation of pitta dosha.²
- They move about in the remaining hours of night except for the last yama of night.³
- They are potent in old age.⁴
- Their poison is amla (sour) and usna (hot).⁵

मण्डली सर्प दंश सामान्य लक्षणः

General Signs and Symptoms of Bite by Mandali Sarpa:

In general, the signs and symptoms of bite by a mandali sarpa include the following.⁶

पीतत्व त्वगादीनां	-	Yellowish discolouration of skin and other parts
शीताभिलाष	-	desire towards cold.
परिधूपन	-	local burning sensation.
दाह	-	burning sensation
तृष्णा	-	excessive thirst
मद	-	intoxication
मूर्च्छा	-	fainting
ज्वर	-	fever
शोणितागमन ऊर्ध्व अधश्च	-	bleeding from upper and lower orifices.
मांसानामवशातनं	-	falling off of muscles.
श्वयथु	-	swelling
दंशकोथ	-	putrifaction of the site of bite
पीतरूपदर्शन	-	person sees all things yellow
आशुकोप	-	person become angry quickly
पित्तवेदना	-	other symptoms of aggravation of pitta

१. द्वाविंशतिर्मण्डलिनो.....। (सु.क. ४/१२)
२.पित्तं मण्डलिनश्चापि। (सु.क. ४/२९)
३. रजन्याः पश्चिमे यामे सर्पाश्चित्रा श्यरन्ति हि, शेषेषूक्ता मण्डलिनो.....। (सु.क. ४/३१)
४.वृद्धा मण्डलिनस्तथा॥ (सु.क. ४/३२)
५.अम्ल उष्ण॥ (अ.सं.उ. ४१/६)
६. मण्डलिविषेण त्वगादीनां पीतत्वं शीताभिलाषः परिधूपनं दाहस्तृष्णा मदो मूर्च्छा ज्वरः शोणितागमनमूर्ध्वमधश्च मांसानामवशातनं श्वयथुर्दंशकोथः पीतरूपदर्शनमाशुकोपस्तास्ताश्च पित्तवेदना भवन्ति । (सु.क. ४/३७)

Other symptoms, apart from the above, as mentioned in Astanga Sangraha include.¹

उष्मा	-	site has great heat locally
सशोष	-	site is dry
पृथु विसर्प दाह	-	muscle becomes thick with visarpa (herpes)
ओष क्लेद		like ulcer accompanied
कोथैर्विशीर्यते		with burning sensation, heat, moistness (exudation), putrefaction and falls off.
विकारा वक्त्र दन्तादि	-	associated abnormalities such as
पीतता		yellowishness of the face, teeth etc.
श्रम	-	fatigue
भ्रम	-	giddiness
तिक्त वक्त्रत्वं	-	bitter taste in the mouth.
धूमक	-	feeling of smoke coming up from the stomach
आशु सर्वाङ्ग विसृति	-	accumulation and flow of fluids from the entire body.

मण्डली विष वेग लक्षण एवं चिकित्सा:

वेग	धातु	लक्षण ^{२,३}	चिकित्सा
प्रथम	रक्तधातु	तत् प्रदुष्टं पीततामुपैति- vitiated blood become yellow परिदाहः- burning sensation पीतावभासता चाङ्गानां-yellow colouration of the body	रक्तमोक्षण
द्वितीय	मांसधातु	अत्यर्थं पीतता- excess yellowish discoloration परिदाह- excessive burning sensation दंश श्वयथु- excessive swelling at bite site.	अगदपान along with मधु and घृत वमन यवागू पान

१. दंशो मण्डलानां सोष्मा सशोषः पीतलोहितः पृथुर्विसर्प दाहोषाक्लेदकोथैर्विशीर्यते॥

विकारा वक्त्र दन्तादि पीतता तृट् श्रमो भ्रमः। दाहो मूर्च्छा ज्वर स्तिक्त वक्त्रत्वं पीतदर्शनम्॥

रक्तागमन मूर्ध्वाधः शीतेच्छा धूमको मदः। आशुसर्वाङ्ग विसृतिर्गदास्ते ते च पित्तजाः॥

२. मण्डलानां प्रथमे वेगे विषं शोणितं दूषयति। तत् प्रदुष्टं पीततामुपैति, तत्र परिदाहः पीतावभासता चाङ्गानां भवति; द्वितीये मांसं दूषयति, तेनात्यर्थं पीतता परिदाहो दंशश्चयथ भवति; तृतीये मेदो दूषयति, तेन पूर्ववच्चक्षुर्यहणं तृष्णा दंशक्लेद स्वेदश्च; चतुर्थे कोष्ठमनुप्रविश्य ज्वरमापादयति; पञ्चमे परिदाहं सर्वगात्रेषु करोति षष्ठसप्तमयोः पूर्ववत्। (सु.क. ४/३९)

३. अथ मण्डलिदष्टस्य दुष्टं पीतीभवत्यसृक्। तेन पीताङ्गता दाहो द्वितीये श्वयथूद्भवः॥

तृतीये दंशक्लेदः स्वेदस्तृष्णा च जायते। चतुर्थे ज्वर्यते दाहः पञ्चमे सर्वगात्रगः॥ (अ.सं.उ. ४१/६५)

चिकित्सा^{१,२}

वेग	धातु	लक्षण	चिकित्सा ^{१,२}
तृतीय	मेद	चक्षुर्ग्रहणं- loss of movement of eye तृष्णा- thirst दंशक्लेदः- moistness of bite site स्वेद- perspiration	तीक्ष्ण शोधन यवागू पान वमन, पेयपान (अ.सं.उ.)
चतुर्थ	कोष्ठ	ज्वर- fever	वमन, यवागू पान
पञ्चम	अस्थि	परिदाह- burning sensation all over the body	शीतोपचार तीक्ष्ण शोधन तीक्ष्ण वमन यवागू पान
षष्ठ	मज्जा	गात्राणां गौरव- heavyness of body मूर्च्छा- fainting अतिसार- diarrhoea हृत्पीडा- heart pain अविपाक- indigestion	काकोल्यादि गण पेय अगदपान पध्मकादि गण कषाय
सप्तम	शुक्र	श्लेष्मवर्ति प्रादुर्भाव- appearance of wicks of kapha in the channals. कटीपृष्ठ भङ्ग cutting pain in waist and back, सर्वचेष्टाविघात- loss of all movements लाला स्वेदयोरति प्रवृत्ति- excessive elimination of saliva and sweat उच्छ्वास निरोध- obstruction of respiration	अवपीड नस्य अगदपान

राजीमान सर्प लक्षण- (Identification of Rajemanta Sarpa):

स्निग्धा विविधवर्णाभि स्तिर्यगूर्ध्वं च राजिभिः । चित्रिता इव ये भान्ति राजिमन्तस्तु ते स्मृताः ॥ (सु.क. ४/२४)

१. पूर्वे मण्डलिनां वेगे दर्वीकरवदाचरेत् । अगदं मधुसर्पिभ्यां द्वितीये पाययेत् च ।
वामायित्वा यवागूं च पूर्वोक्तामथ दापयेत् । तृतीये शोधितं तीक्ष्णैर्यवागूं पाययेद्धिताम् ॥
चतुर्थे पञ्चमे चापि दर्वीकरवदाचरेत् ॥
काकोल्यादिर्हितः षष्ठे पेयश्च मधुरोऽगदः । हितोऽवपीडे त्वगदः सप्तमे विषनाशनः ॥ (सु.क. ५/२४-२७)
२. तृतीये वामितः पेयां वेगे मण्डलिनां पिबेत् । अतीक्ष्णमगदं षष्ठे गणं वा पध्मकादिकम् ॥ (अ.स.उ. ४२/७४)

Snakes which are unctuous (slimy), of many colours, decorated with stripes above and sides of their body, should be known as Rajeemanta.

- They are 10 in number.¹
- They cause aggravation of kapha dosha.²
- They move about during the last yama (three hours) of night.³
- They are potent in their middle age.⁴
- Their poison is sweet (swadu) and cold (sheetala).⁵

राजीमन्त सर्प दश सामान्य लक्षणः

The General Signs and Symptoms of Bite by Rajeemanta Sarpa:

In general, the signs and symptoms of bite by a rajeemanta sarpa include the following.⁶

स्निग्धः	-	site is unctuous
स्थिर	-	site is firm
पिच्छिल	-	site is slimy
शोफकृत्	-	bite site is swollen
सान्द्रास्रः शिशिरः	-	blood which is thick, cold, white in colour
पाण्डुस्तद्विकाराः		flows out.
शिरोव्यथा	-	headache
अरुचि	-	anorexia
छर्दि	-	vomiting
आलस्य	-	laziness
हल्लास	-	nausea
मधुरास्यता	-	sweetness in the mouth
कण्ठे घुरघुरः	-	rumbling sound in the throat
पाको	-	ulcers in mouth
कण्डूरक्षणो	-	itching in the eyes

१.राजिमन्तस्तथा दश। (सु. क. ४/१२)

२.कफं चानेकराजयः । (सु. क. ४/२९)

३.रजन्या पश्चिमे यामे सर्पाश्चित्राश्चरन्ति हि॥ (सु. क. ४/३१)

४.राजिमन्तो वयो मध्या जायन्ते मृत्यु हेतवः। (सु. क. ४/३२)

५.स्वादु शीतलम्। (अ. ह. उ. ४१/६)

६. दंशो राजीमतां स्निग्धः स्थिपिच्छिलशोफकृत् । सान्द्रास्रः शिशिरः पाण्डुस्ताद्विकाराः शिरोव्यथा॥

अरुचिश्छर्दिरालस्यं हल्लासो मधुरास्तया । कण्ठे घुरघुरः पाको कण्डूरक्षणोर्हिमो ज्वरः ॥

कृच्छ्रादुच्छ्वसनं निद्रा कासः श्वेतनखादिता । स्तम्भो गुरुत्वं चाङ्गानां नासिकाक्षिमुखस्तुतिः ॥

रोमहर्षस्तमश्वासो रोगाश्चाऽन्ये कफोद्भवाः ॥ (अ. सं. उ. ४१/३८)

हिमो ज्वरः	-	fever with chills
कृच्छ्रादुच्छ्वसनं	-	difficulty in respiration
निद्रा	-	sleep
कासः	-	cough
श्वेतनख	-	white colour of nails
स्तंभो गुरुत्वं चाङ्गानां	-	rigidity and heaviness of the body
नासिकाक्षिमुखस्रुति	-	discharge from the nose, eyes and mouth
रोमहर्ष	-	horripilations
स्तमश्वास	-	dyspnoea
रोगाश्चन्ये कफोद्भवा	-	abnormalities of kapha origin.
Other symptoms, apart from the above, as explained in sushruta samhita include. ¹		
शुक्लत्वं त्वगादीनां	-	white colour of the skin
सान्द्र कफ प्रसेक	-	elimination of thick kapha (saliva and froth)

राजीमान् विष वेग लक्षण एवं चिकित्सा

वेग	धातु	लक्षण ^{१,२}	चिकित्सा
प्रथम	रक्त	पाण्डुताम् उपैति- blood becomes yellowish white in colour	रक्तमोक्षण with अलाबु अगदपान
		रोमहर्ष- horripilation	with मधु-घृत
		शुक्लावभासश्च पुरुषो भवति-whitish appearance of the body.	
द्वितीय	मांस	पाण्डुता अत्यर्थ- profound yellowish white colour of the body	वमन
		जाड्यं- lassitude	विषहर अगदपान
		शिरःशोफ- oedema of the face	
		अतिगुरुता- extreme heaviness of body	
तृतीय	मेद	चक्षुर्ग्रहणं- loss of movement	नस्य

- राजिमद्विषेण शुक्लत्वं त्वगादीनां शीतज्वरो रोमहर्षः। स्तब्धत्वं गात्राणामादंशशोफः सान्द्रकफ प्रसेक उध्वास निरोधस्तमः प्रवेशस्तास्ताश्च कफवेदना भवन्ति॥ (सु.क. ४/३७)
- राजिमान् प्रथमे वेगे विषं शोणितं दूषयति । तत् प्रदुष्टं पाण्डुतामुपैति, तेन रोमहर्षः शुक्लावभासश्च पुरुषो भवति; द्वितीये मांसं दूषयति, तेन पाण्डुताऽत्यर्थं जाड्यं शिरःशोफश्च भवति, तृतीये मेदो दूषयति, तेन चक्षुर्ग्रहणं दंशक्लेदः स्वेदो घ्राणाक्षिस्रावश्च भवति, चतुर्थे कोष्ठमनुप्रविश्य मन्यास्तम्भं शिरोगौरवं चापादर पञ्चमे वाक्सङ्ग शीतज्वरं च करोति, षष्ठसप्तम पूर्ववदिति॥ (सु.क. ४/३९)
- दष्टस्य राजिलैर्दुष्टं पाण्डुतां याति शोणितम् । पाण्डुता तेन गात्राणां द्वितीये गुरुताऽति च॥ तृतीये दंशक्लेद नासिकाक्षि मुखस्रवाः । चतुर्थे गरिमा मूर्ध्नो मन्यास्तम्भाश्च पञ्चमे॥ वाक्यसङ्गो ज्वरः शीताः शोषयोः पूर्वद्वेदेत्॥ (अ.सं.उ. ४१/६८)

वेग	धातु	लक्षण	चिकित्सा ^{१,२}
		of eyes दंशक्लेदः-moistness at site of bite स्वेद- perspiration घ्राणाक्षि स्रावश्च- exudation from the nose and eyes	अञ्जन
चतुर्थ	कोष्ठ	मन्यास्तम्भ- stiffness of neck शिरोगौरवं- heaviness of head	वमन यवागू पान
पञ्चम	अस्थि	वाक्सङ्ग- loss of speech शीतज्वरं- fever with chills	शीतोपचार तीक्ष्ण शोधन यवागू पान
षष्ठ	मज्जा	गात्राणां गौरवं- heavyness of the body मूर्च्छा- fainting अतिसार- diarrhoea हृत्पीडा- heart pain अविपाक- indigestion	अञ्जन
सप्तम	शुक्र	श्लेष्मवर्ति प्रादुर्भाव- appearance of wicks of kapha in the channels कटीपृष्ठ भङ्ग- cutting pain in the waist and back सर्वचेष्टाविधात- loss of all movements लाला स्वेदयोरति प्रवृत्ति- excessive elimination of saliva and sweat उच्छवास निरोध- obstruction of respiration	तीक्ष्ण अवपीड नस्य तीक्ष्ण अञ्जन काकपद चिकित्सा

SNAKES

Taxonomy:

Suborder: **Serpentes**

Order : Squamata

Infraorders : Alethinophidia and Scolecophidia

१. पूर्वे राजिमतां वेगे अलाबुभिः शोणितं हरेत् । अगदं मधुसर्पिभ्यां संयुक्तं पाययेत् च॥
वान्तं द्वितीये त्वगदं पाययेद्विषनाशनम् । तृतीयादिषु त्रिष्वेवं विधिर्दर्वीकरो हितः॥
षष्ठे अञ्जनं तीक्ष्णतम अवपीडश्च सप्तमे॥ (सु.क. ५/२८-२९)
२. आघेवगाढं प्रच्छाय वेगे दष्टस्य राजिलैः । अलाबुना हरेद्रक्तं पूर्ववच्चागदं पिबेत्॥
षष्ठे वेगेञ्जनं तीक्ष्णमवपीडं च योजयेत् । अनुक्तेषु च वेगेषु क्रियां दर्वीकरोदिताम्॥(अ.सं.उ.४२/७५-७६)

Families :**Infraorder - Alethinophidia: 15 Families**

Family	Genera	Species	Common Names
Acrochordidae	1	3	Wart snakes
Aniliidae	1	1	False coral snake
Anomochilidae	1	2	Dwarf pipe snakes
Atractaspididae	12	64	Burrowing asps
Boidae	8	43	Boas
Bolyeriidae	2	2	Split jaw snakes
Colubridae	304	1938	Typical snakes
Cylindrophiidae	1	8	Asian pipe snakes
Elapidae	61	235	Elapids
Loxocemidae	1	1	Mexican burrowing snake
Pythonidae	8	26	Pythons
Tropidophiidae	4	22	Dwarf boas
Uropeltidae	8	47	Shield-tailed snakes
Viperidae	32	224	Vipers
Xenopeltidae	1	2	Sunbeam snakes

Infrorder Scolecophidia: 3 Families

Family	Genera	Species	Common Names
Anomalepidae	4	15	Primitive blind snakes
Leptotyphlopidae	2	87	Slender blind snakes
Typhlopidae	6	203	Typical blind snakes

Perception:**Smell:**

Snakes use smell to track their prey. They smell by using their forked tongues to collect airborne particles, then passing them to the vomeronasal organ or Jacobson's organ in the mouth for examination. The fork in the tongue gives snakes a sort of directional sense of smell and taste simultaneously. They keep their tongues constantly in motion, sampling particles from the air, ground, and water, analyzing the chemicals found, and determining the presence of prey or predators in the local environment.

Eyesight:

Snake vision varies greatly, from only being able to distinguish light from dark to keen

eyesight, but the main trend is that their vision is adequate although not sharp, and allows them to track movements.

Infrared Sensitivity:

Pit vipers, pythons, and some boas have infrared-sensitive receptors in deep grooves on the snout, which allow them to “see” the radiated heat of warm-blooded prey mammals. In pit vipers the grooves are located between the nostril and the eye, in a large “pit” on each side of the head. Other infrared-sensitive snakes have multiple, smaller labial pits lining the upper lip, just below the nostrils.

Vibration Sensitivity:

The part of the body in direct contact with the ground is very sensitive to vibration; thus, a snake can sense other animals approaching by detecting faint vibrations in the air and on the ground.

Skin:

The skin of a snake is covered in scales. Snake skin has a smooth, dry texture. Most snakes use specialized belly scales to travel, gripping surfaces. The body scales may be smooth, keeled, or granular. The eyelids of a snake are transparent “spectacle” scales, which remain permanently closed, also known as brille.

Moulting:

The shedding of scales is called ecdysis (or in normal usage, molting or sloughing). In the case of snakes, the complete outer layer of skin is shed in one layer. Snake scales are not discrete, but extensions of the epidermis-hence they are not shed separately but as a complete outer layer during each molt. The shape and number of scales on the head, back, and belly are often characteristic and used for taxonomic purposes. Moulting serves a number of functions. Firstly, the old and worn skin is replaced; secondly, it helps get rid of parasites such as mites and ticks.

Molting occurs periodically throughout the snake’s life. Before a molt, the snake stops eating and often hides or moves to a safe place. Just before shedding, the skin becomes dull and dry looking and the eyes become cloudy or blue-colored. The inner surface of the old skin liquefies. This causes the old skin to separate from the new skin beneath it. After a few days, the eyes clear and the snake “crawls” out of its old skin. The old skin breaks near the mouth and the snake wriggles out, aided by rubbing against rough surfaces. In many cases, the cast skin peels backward over the body from head to tail in one piece, like pulling a sock off inside-out. A new, larger, brighter layer of skin has formed underneath.

An older snake may shed its skin only once or twice a year. But a younger snake, still growing, may shed up to four times a year. The discarded skin gives a perfect imprint of the

scale pattern, and it is usually possible to identify the snake if the discarded skin is reasonably intact.

Skeleton:

The skeleton of most snakes consists solely of the skull, hyoid, vertebral column, and ribs, though henophidian snakes retain vestiges of the pelvis and rear limbs.

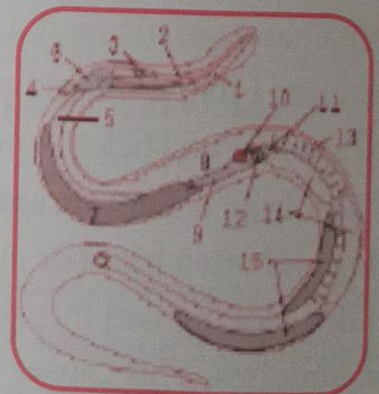
The skull of the snake consists of a solid and complete neurocranium, to which many of the other bones are only loosely attached, particularly the highly mobile jaw bones, which facilitate manipulation and ingestion of large prey items. The left and right sides of the lower jaw are joined only by a flexible ligament at the anterior tips, allowing them to separate widely, while the posterior end of the lower jaw bones articulate with a quadrate bone, allowing further mobility. The bones of the mandible and quadrate bones can also pick up ground borne vibrations. Because the sides of the jaw can move independently of one another, snakes resting their jaws on a surface have sensitive stereo hearing which can detect the position of prey. The hyoid is a small bone located posterior and ventral to the skull, in the 'neck' region, which serves as an attachment for muscles of the snake's tongue.

The vertebral column consists of anywhere between 200 to 400 (or more) vertebrae. Tail vertebrae are comparatively few in number and lack ribs, while body vertebrae each have two ribs articulating with them. The vertebrae have projections that allow for strong muscle attachment enabling locomotion without limbs.

Internal Organs:

Anatomy of a snake.

1. Esophagus, 2. Trachea, 3. Tracheal lungs, 4. Rudimentary left lung, 5. Right lung, 6. Heart, 7. Liver, 8. Stomach, 9. Air sac, 10. Gallbladder, 11. Pancreas, 12. Spleen, 13. Intestine, 14. Testicles, 15. Kidneys.



The snake's heart is encased in a sac, called the pericardium, located at the bifurcation of the bronchi. The heart is able to move around, however, owing to the lack of a diaphragm. This adjustment protects the heart from potential damage when large ingested prey is passed through the esophagus. The spleen is attached to the gall bladder and pancreas and filters the blood. The thymus gland is located in fatty tissue above the heart and is responsible for the generation of immune cells in the blood. The cardiovascular system of snakes is also unique for the presence of a renal portal system in which the blood from the snake's tail passes through the kidneys before returning to the heart.

The vestigial left lung is often small or sometimes even absent, as snakes' tubular

bodies require all of their organs to be long and thin.

In the majority of species, only one lung is functional. Many organs that are paired, such as kidneys or reproductive organs, are staggered within the body, with one located ahead of the other.

Teeth:

Snakes are polyphyodonts with teeth that are continuously replaced.

Venom:

The venom is modified saliva, delivered through fangs. Snake venoms are complex mixtures of proteins, and are stored in venom glands at the back of the head. A detailed description of the composition of the snake venom is explained later.

Interaction with Humans:

Snakes do not ordinarily prey on humans. Unless startled or injured, most snakes prefer to avoid contact and will not attack humans. With the exception of large constrictors, nonvenomous snakes are not a threat to humans. The bite of a nonvenomous snake is usually harmless; their teeth are not designed for tearing or inflicting a deep puncture wound, but rather grabbing and holding. Although the possibility of infection and tissue damage is present in the bite of a nonvenomous snake, venomous snakes present far greater hazard to humans.

Difference Between Venomous and Non-venomous Snakes:

Venomous snakes



Usually have a triangular-shaped or diamond-shaped head



Head scales are usually small

Non-venomous snakes



Usually have a rounded head



Head scales are usually large



In some varieties, pupils look like slits.



Pupils are circular



Possess long - canalized fangs through which they inject the venom.



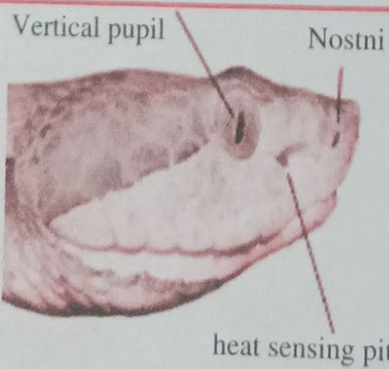
Have no fangs. May have sharp teeth.



Bite marks- usually two.



Bite marks usually many.

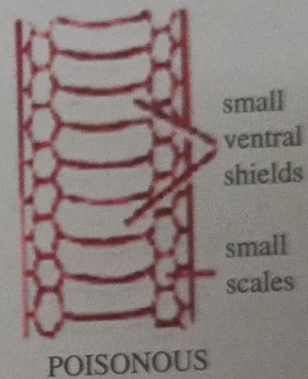
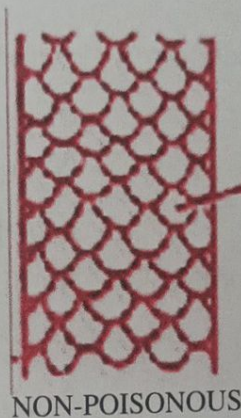
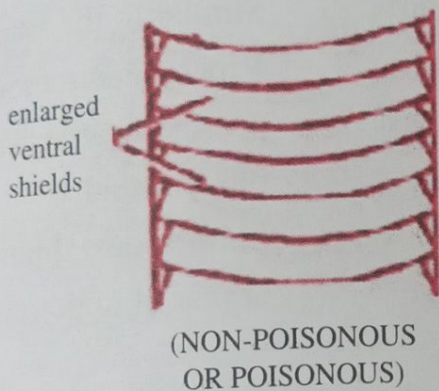
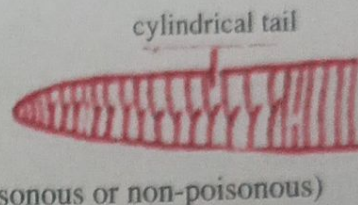
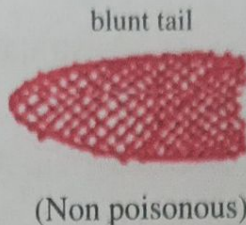
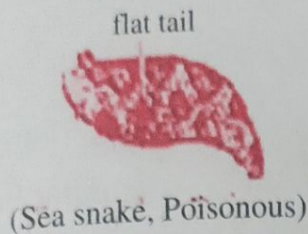


May have a heat sensing pit on the head

Often do not have a heat sensing pit on the head

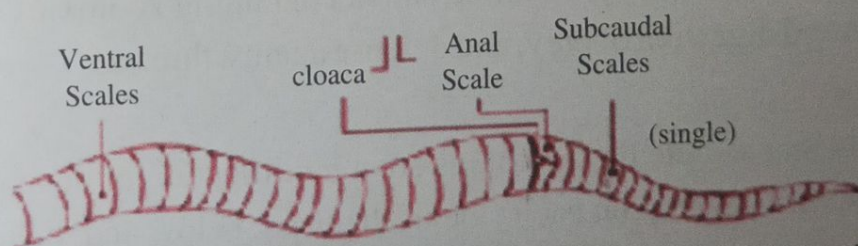
The tail is flat, laterally compressed and boar-shaped (adaptation to swimming in water), it is usually a sea snake.

The tail ends bluntly in non poisonous. If the tail is round or cylindrical and pointed, it may be poisonous or non-poisonous.

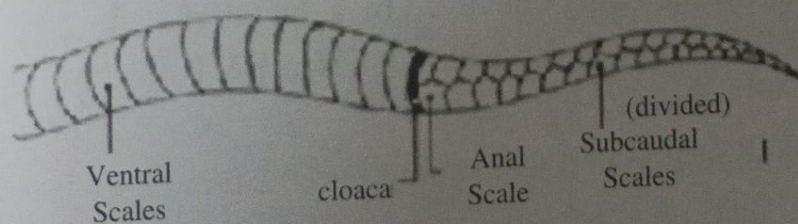


Ventrals are broad extending completely across the belly - Poisonous or a non-poisonous snake.

Scales on the ventral side of the trunk small and narrow or ventrals are fairly broad, small scales are present on either side.



Venomous snakes, have a single row of scales on the end of the tail. (from the anus to the very end.) i.e caudal scales- entire.



The tail of non- venomous snakes has a double row of scales on the end of the tail (from the anus to the very end.) i.e caudal scales- divided.

Systematic Classification of Venomous Snakes in the World

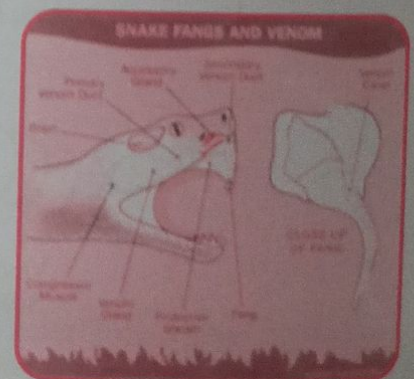
Family	Species	Distribution	Characteristics
Elapidae	Kraits, Cobras, Mambas, Coral snakes	Americas, Africa, fixed fangs, Asia, Australasia	Small head, short and
Viperidae	Viper snakes	Europe, Africa, Asia	Large, flattened triangular head, large grooved fangs on the maxillary bone.
Crotalidae	Rattlesnakes	Americas, Parts of Southeast Asia, Southeast Europe	Similar to the family Viperidae, but they possess heat-sensitive pits on head
Colubridae	Tree snakes	In all parts of the world, except Australia	Short grooved fangs at rear of upper jaws.
Hydrophidae	Sea snakes	Asia and Australia	Nostrils dorsally on head, flattened tail.

Venom and Venom Apparatus:

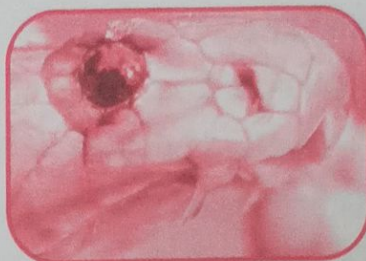
Snake venom is the highly modified saliva containing zootoxins which facilitates the immobilization and digestion of prey, and defense against threats.

Venom Apparatus

- The glands that secrete the zootoxins are a modification of the parotid salivary gland and are usually situated on each side of the head, below and behind the eye, and encapsulated in a muscular sheath.
- The glands have large alveoli in which the synthesized venom is stored before being conveyed by a duct to the base of channeled or tubular fangs through which it is ejected.
- Fangs are teeth modified to inject venom into the prey and are 2 in number on either side.
- Are backward curved, fixed or movable, hollow and have sharp- pointed ends.



- When the snake bites, the jaws close and the muscles surrounding the gland contract, causing venom to be ejected via the fangs.
- The fangs are shed and replaced for about 5-7 replacements.
- The size of the fangs vary from:
 - 2-4 mm long in kraits
 - 5-10 mm long in cobra
 - 8-10 mm in king cobra.
 - About 25 mm in Russell's viper.



Cobra



Russell's

Snake Venom:

- Snake venom is a complex mixture of proteins, enzymes, and various other substances with toxic and lethal properties.
- Venoms contain more than 20 different compounds, mostly proteins and polypeptides.
- Proteins constitute 90-95% of venom's dry weight and they are responsible for almost all of its biological effects.
- Among the venom, there are toxins as well as nontoxic proteins and many enzymes, especially hydrolytic ones.
- Polypeptide toxins include cytotoxins, cardiotoxins, and postsynaptic neurotoxins which bind to acetylcholine receptors at neuromuscular junctions.

Main Enzymes of Snake Venom

Type	Name	Origin
Oxydoreductases	Dehydrogenase lactate	Elapidae
	L-amino-acid oxidase	All species
	Catalase	All species
Transferases	Alanine amino transferase	
Hydrolases	Phospholipase A ₂	All species
	Lysophospholipase	Elapidae, Viperidae
	Acetylcholinesterase	Elapidae
	Alkaline phosphatase	Bothrops atrox
	Acid phosphatase	Deinagkistrodon acutus
	5'-Nucleotidase	All species
	Phosphodiesterase	All species
	Deoxyribonuclease	All species

Type	Name	Origin
	Ribonuclease I	All species
	Adenosine triphosphatase	All species
	Amylase	All species
	Hyaluronidase	All species
	NAD-Nucleotidase	All species
	Kininogenase	Viperidae
	Factor-X activator	Viperidae, Crotalinae
	Heparinase	Crotalinae
	α -Fibrinogenase	Viperidae, Crotalinae
	β -Fibrinogenase	Viperidae, Crotalinae
	α - β -Fibrinogenase	Bitisgabonica
	Fibrinolytic enzyme	Crotalinae
	Prothrombin activator	Crotalinae
	Collagenase	Viperidae
	Elastase	Viperidae
Lyases	Glucosamine ammonium lyase	

- Snake toxins vary greatly in their functions.
- Two broad classes of toxins found in snake venoms are neurotoxins (mostly found in elapids) and hemotoxins (mostly found in viperids).

Fasciculins:

- These toxins attack cholinergic neurons by destroying acetylcholinesterase (AChE).
- ACh therefore cannot be broken down and stays in the receptor.
- This causes tetany or involuntary muscle contraction, which can lead to death.

Dendrotoxins:

- Dendrotoxins inhibit neurotransmissions by blocking the exchange of positive and negative ions across the neuronal membrane leading to no nerve impulse, thereby paralyzing the nerves.

α -Neurotoxins:

- Alpha-neurotoxins attack the nicotinic acetylcholine receptors of cholinergic neurons.
- They mimic the shape of the acetylcholine molecule and therefore fit into the receptors. They block the ACh flow resulting in feeling of numbness and paralysis.

Cytotoxins:**Phospholipases:**

- Phospholipase is an enzyme that transforms the phospholipid molecule into a lysophospholipid soap which attracts and binds fat and ruptures cell membranes.
- Phospholipase A2 inhibits electron transfer at cytochrome C level and renders mitochondrial-bound enzymes soluble.
- It damages red blood cells, leukocytes, platelets, skeletal muscle, vascular endothelium, peripheral nerve endings, and the myoneural junction.

Others:

- Proteases breakdown the proteins and are responsible for local damage like local edema, blistering, early suppuration and necrosis.
- Hyaluronidase reduces the natural resistance of tissues, aids spreading of the venom by increasing the cell permeability.
- L-Amino acid oxidase releases hydrogen peroxide causing oxidation of cells.
- Polypeptides, being smaller molecules, are rapidly absorbed into the systemic circulation and cause systemic toxicity in vessel-rich organs (e.g., heart, lung, kidneys, etc.) as well as at pre- and postsynaptic membranes.

Cardiotoxins:

- Cardiotoxins are components that are specifically toxic to the heart.
- They bind to particular sites on the surface of muscle cells and cause depolarisation thus preventing muscle contraction.
- These toxins may cause the heart to beat irregularly or stop beating, causing death.

Hemotoxins:

- Hemotoxins cause hemolysis, the destruction of red blood cells or induce blood coagulation.

Fatal Dose of Venom:

- Cobra: 10-15 mg of dry venom.
- Krait: 6- 8 mg of dry venom.
- Russell's viper: 40-70 mg of dry venom.
- Saw scaled viper: 5-8 mg of dry venom.

Management of Snake Bite: (**First aid Treatment:**

- Transport to hospital.

- Rapid clinical assessment and resuscitation.
- Detailed clinical assessment and species diagnosis.
- Investigations/laboratory tests.
- Antivenom treatment.
- Observing the response to antivenom.
- Deciding whether further dose of antivenom are needed.
- Supportive/ancillary treatment.
- Treatment of the bitten part.
- Rehabilitation.
- Treatment of chronic complications.

ASV/ Anti Snake Venom

Classification:

- Snake antivenom can be classified by which venoms were used in the production process.
- If the hyperimmunizing venom is obtained from a single species, then it is considered a monovalent antivenom.
- If the antivenom contains neutralizing antibodies raised against two or more species of snakes, then the composition is considered polyvalent.
- In India, Polyvalent antivenom is in use, which is effective against the four dreadful common species, namely Cobra, Krait, Russell's viper and Saw scaled viper.
- The antivenom acts by neutralizing circulating venom in the blood and tissue fluid
- 1 ml of the antivenom available in India neutralizes:
 - Common Cobra [*Naja Naja*]- 0.6 mg
 - Russels viper [*Daboi russeli*]- 0.6 mg
 - Common Krait [*Bangarus Caeruleus*]- 0.45 mg
 - Saw scaled Viper [*Echis Carinatus*]- 0.45 mg

Method of Preparation:

- Snakes maintained in well-managed snake farms are the key element in the production of venom meeting the quality requirements for the production of effective antivenom.
- Snake maintenance, handling and milking, as well as all aspects of venom collection are properly documented and scheduled.
- Venom can be extracted from snakes according to a regular schedule, depending on the species.

- The interval between extractions varies among producers and ranges from every 2 or 3 weeks to every 3 months.
- Period of quarantine is usually from 6 to 12 weeks, during which an appropriate veterinarian assessment is needed.
- Some snake venoms can cause local or systemic toxicity when injected into native horses at the beginning of an immunization course.
- To avoid such toxicity, inoculation is made with a small dose of venom well-emulsified in an adjuvant such as Freund's complete or incomplete adjuvants and immunization of animals is done with those venom.
- Numerous animal species like horse, sheep, donkey, goat and rabbit have been used on various scales in antivenom production and camel, llama, dog and hen for experimental purposes.
- The horse is the animal of choice for commercial antivenom production.
- The areas to be immunized should be thoroughly scrubbed with a disinfectant, shaved and rubbed with 70% ethanol before venom immunogen injection.
- The sites of immunization should be close to major lymph nodes, preferably on the animal's neck and back, while the route of injection should be subcutaneous.
- The initial dose of each venom could be as low as 1-4 mg/horse with a total combined volume of injection of about 2 ml.
- The immunogen is filled in a 1-ml glass syringe with an 18G needle.
- Subcutaneous injections of 100-200 μ l of immunogen are made at each site, up to as many as 8-12 sites.
- After 2 weeks, the horses should receive a booster injection with the same venom well emulsified in Freund's incomplete adjuvant.
- Similar volume and areas of injection to those described above can be made.
- Subsequent booster immunizations at 2-week intervals can be made with higher doses (5-10 mg) of venom in saline or mixed with aluminium salts or any other adjuvant selected.
- Blood (10-20 ml) should be drawn before each immunization.
- Serum or plasma is prepared and EIA (enzyme immunoassay) titres and/or lethality potency are determined.
- When the EIA titres reach a plateau, usually about 8-10 weeks after the primary

immunization, an in vivo potency assay may be performed to confirm that the horse could be bled.

- Animals are bled by venipuncture from the external jugular vein.
- The area surrounding the venipuncture site should be shaved before bleeding and thoroughly cleaned and disinfected, using a disinfectant.
- The clinical condition of the animals being bled should be closely monitored at the time of bleeding and during the days that follow, and bleeding should be suspended in the event of any adverse effect on the animal.
- It is recommended that around 13-15 ml of blood per kilogram body weight are collected in one bleeding session.
- For sheep, 0.5 l is a typical yield, whereas in the case of horses, the volume of blood may range between 3 and 6 l, depending on the size of the animal.
- Blood is collected, ideally, in disposable plastic bags containing sterile citrate anticoagulant.
- They should be put into a refrigerated room ($2-8^{\circ}\text{C}$) for the plasma and blood cells separation procedure.
- Hyperimmune plasma should be separated from blood cells under aseptic conditions and should be transferred into sterile containers.
- Blood cells, most specifically erythrocytes (red blood cells), should be separated from plasma by validated centrifugation or sedimentation procedures.
- Plasma from individual animals should be pooled into sterile and sanitized containers before fractionation.
- Antivenoms are prepared from the starting plasma pool using diverse methods to obtain one of the following active substances: - intact IgG molecules; F(ab')_2 fragments; or Fab fragments.
- Lastly, the above mentioned active substances are subjected to purification.
- Quality control tests, including potency assessment by in vivo assay is mandatory before marketing.

Storage Forms of ASV:

- Liquid and Lyophilized (A storage process where venoms are dehydrated under vacuum in the presence of calcium salts or phosphoric acid)
- Liquid serum- very unstable at room temp- requires $0-4^{\circ}\text{C}$. It deteriorates in 2 yrs.
- Lyophilized/Desiccated serum- many times more stable than liquid, retains potency up

to 5 yrs if stored in a dark & cool place.

Indications for ASV

- Antivenom treatment is recommended if and when a patient with proven or suspected snake-bite develops one or more of the following signs:
- Systemic envenoming
- Haemostatic abnormalities: Spontaneous systemic bleeding (clinical), coagulopathy (incoagulable blood in 20WBCT or other laboratory tests such as prothrombin time) or thrombocytopenia ($<100 \times 10^9/\text{litre}$ or $100000/\text{cu mm}$) (laboratory).
- Neurotoxic signs: ptosis, external ophthalmoplegia, paralysis etc (clinical).
- Cardiovascular abnormalities: hypotension, shock, cardiac arrhythmia (clinical), abnormal ECG.
- Acute kidney injury (renal failure): oliguria/anuria (clinical), rising blood creatinine/urea (laboratory).
- Haemoglobin/myoglobinuria: dark brown urine, other evidence of intravascular haemolysis or generalised rhabdomyolysis (muscle aches and pains, hyperkalaemia)
- Supporting laboratory evidence of systemic envenoming.

Contra Indication for ASV:

- Significant allergic disease
- History of an adverse reaction to serum injection
- Severe asthma or who have reacted to horse serum in the past.

Adverse Reactions to ASV

- Usually more than 20% of cases will develop either early (within few hours) or late (5 days or more) allergic reactions following ASV administration
- Early reactions are of two types -
- Early anaphylactic reactions and Pyrogenic reactions.

Early Reactions:

- They develop within 10-180 min of starting antivenin and include urticaria, vomiting, abdominal colic, diarrhea, tachycardia.
- Minority develop fatal anaphylaxis including hypertension, bronchospasm and angioneuritic oedema.

Pyrogenic Reactions:

- Develop 1-2 hrs after starting ASV therapy.
- Include fever, rigor, chill, lower blood pressure etc.

- It develops due to the pyrogenic contamination of ASV and diluting fluid.

Late Serum Sickness

- Develop 1-12 days (mean 7day) after treatment.
- Clinical features include fever, nausea, vomiting, diarrhoea, itching, recurrent urticaria, arthralgia, myalgia, lymphadenopathy, periarticular swellings, mononeuritis multiplex, proteinuria with immune complex nephritis and, rarely encephalopathy.
- Patients who suffer early reactions are treated with antihistamines and corticosteroids.

Manufacturers of ASV in India:

- Bengal chemicals & pharmaceuticals, Calcutta
- Central Research Institute, Kasauli
- Haffkine Biopharmaceutical Company, Ltd. Mumbai
- King's Institute of Preventive Medicine, Madras
- Serum Institute of India, Pune.
- VINS Biproduct Ltd., Hyderabad.
- Bharat Serum and Vaccines Ltd., Mumbai.
- Biological E Ltd., Hyderabad.

Spectacled Cobra

Scientific Name	:	Naja naja
Family	:	Elapidae
Venom Type	:	Neurotoxic

Introduction:

The name "cobra" is short for cobra-de-capelo, which is Portuguese for "snake with hood", or "hood-snake". These snakes can spread their neck ribs to form a flattened, widened hood. The genus *Naja* contains over 20 species of cobras and is the most widespread and widely recognized genus of cobras, sometimes called the "true" cobras. Members of the genus inhabit a range from Africa through the Middle East, India, and Southeast Asia to Indonesia. In India, it is distributed throughout the country except the islands and Himalayan hills.

Although the king cobra, *Ophiophagus hannah*, the world's longest venomous snake, is a member of the Elapidae and can raise a rather narrow hood if disturbed, it is not in the genus *Naja*, and, accordingly, is not a true cobra.

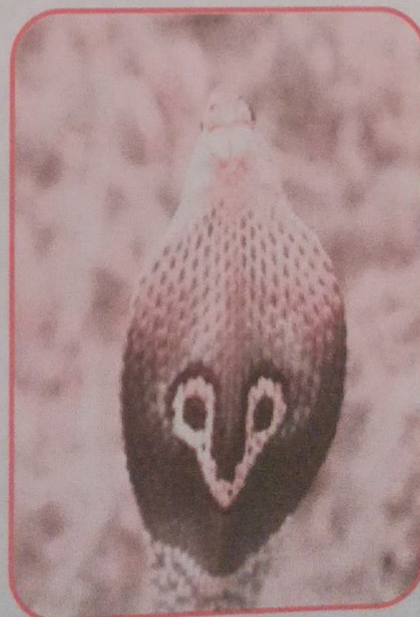
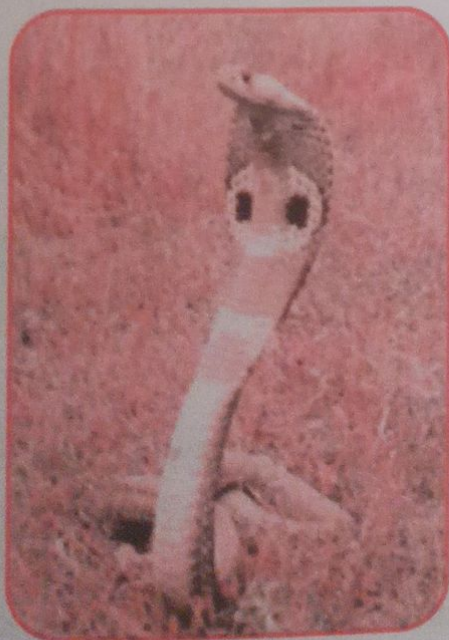
Cobras, with their threatening hoods and intimidating upright postures, are some of the most iconic snakes on Earth.

Taxonomy:

Kingdom	:	Animalia
Sub-kingdom	:	Bilateria
Infra-kingdom	:	Deuterostomia
Phylum	:	Chordata
Subphylum	:	Vertebrata
Infra phylum	:	Gnathostomata
Super class	:	Tetrapoda
Class	:	Reptilia+
Order	:	Squamata
Suborder	:	Serpentes
Infraorder	:	Alethinophidia
Family	:	Elapidae
Genus	:	Naja
Species	:	20

The Four Most Commonly Found Species in India Include:

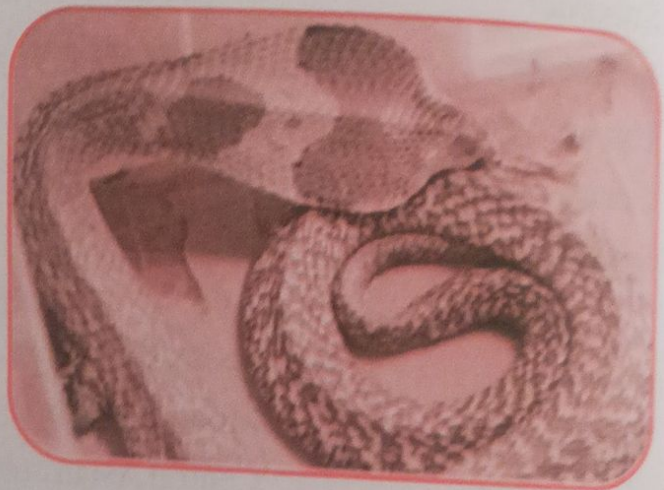
Naja naja	:	Spectacled cobra.
Naja kaouthia	:	Monocled cobra.
Naja oxiana	:	Central Asian cobra.
Naja sagittifera	:	Andaman cobra.

1. Spectacled Cobra - Naja naja

2. Monocled Cobra- *Naja kaouthia*:



3. Central Asian Cobra- *Naja oxiana*



4. Andaman Cobra- *Naja sagittifera*.



Characteristics for Identification:

Cobras are Elapids, a type of poisonous snake, are large snakes; many species reaching to more than 6 feet long (2 meters).

Hood:

- The most well-known distinctive physical characteristic of cobras is their hood.

- Hooding occurs when the snake spreads out its neck ribs forming a flattened, widened section of its body near the head.
- That is, when the neck muscles contract, the longer ribs stand out sideways and the neck expands laterally, getting the characteristic hood shape.
- This creates a stunning, and threatening spectacle.
- It is primarily used to make the Cobra appear bigger and scarier.
- This amazing hood contains loose skin which the Cobra can inflate with air from his lungs, expanding the movable ribs.
- On the hood is monocle or spectacled marking on the top of the neck in the dorsal aspect.
- In the underside of the hood one can find broad faint stripes, above which are two dark spots, surrounded by white borders.

Description:

New born	:	25-30 cm.
Average length	:	150 cm.
Maximum length	:	210 cm.

Dorsal:

- Body slender with smooth oval shaped scales.
- Dorsal color includes yellow, all shades of brown, dark gray, reddish, black or black mixed with blue, purple, red etc.
- Side dorsal scales larger and clearly oval shaped while scales on the top narrower and become pointed.

Ventral:

- Belly color depends on dorsal color and ranges from milky white, yellowish, white mixed with purple, red, brown, gray etc with or without dark patches.

Head:

- Head triangular with rounded edge, not broader than neck.
- The famous hood mark appears when stretched on provocation.
- Hood marks vary in design.
- In dark colored specimens (from North India) hood mark becomes faint or absent in adults.
- Eyes have rounded pupil.

Tail:

- Slightly shorter than typical range and ends with pointed tip.
- Black color specimens sometimes bear darker tail.

Scalation:**Head:**

Usually a single cuneate scale on each side; supralabial 7; 3rd & 4th touches eyes; 3rd significantly larger than rest of frontal supralabials; preocular 1, touches posterior nasal hence loreal absent; postocular 3; temporal 2+3.

Dorsal:

Males- 23-37 (at 10th ventral): 19-25 (at 20% of ventral): 21-25 (at 40% of ventral): 19-23 (at 60% of ventral): 13-18 (at 80% of ventral): 15-18 (at vent).

Females- 23-37 (at 10th ventral): 19-25 (at 20% of ventral): 20-25 (at 40% of ventral): 17-24 (at 60% of ventral): 15-17 (at 80% of ventral): 15-18 (at vent).

Ventral:

171-197 (Male), 178-196 (Female).

Sub Caudal:

53-67 (Male), 50-65 (Female); anal undivided; paired.

Habitat:

- Found both in hills and plains.
- Distributed in variety of forests of Indian mainland which includes rainforest, mixed, moist and dry deciduous forests, grassland, wetland, desert etc.
- Lives in dense & open forests, agricultural lands, city outskirts, around wetlands, rocky terrain having mounds and deep hiding places, old woods etc.
- Hides in mounds, holes, piles, caves, cracks etc.

Natural History:

- Spectacled Cobra is basically a nocturnal species but it can be seen at daytime also.
- Activity terrestrial but can climb well when needed for foraging and roosting.
- Behavior alert and aggressive.
- On provocation raise its forebody to show famous hood and hiss loudly to give warnings.
- Gives mock attacks initially but can bite in furry.
- They possess hollow fangs fixed to the top jaw at the front of the mouth, through which they inject the venom.

- Colours vary widely from species to species. There are red, yellow, black, mottled, banded and many other colours and patterns of cobra.

Diet:

- It preys on variety of animals including frogs, toads and mostly rodents.
- Also feed on birds, other snakes including venomous ones, small mammals (mongoose and kittens), eggs etc.
- Can climb up to good heights on roof tops and trees in search of food.

Reproduction:

- Mating begins during post winter season with male combat.
- Winning male performs mating rituals with female.
- Egg lying and guarding done by female in mounds and caves.
- It can lay up to 30 eggs and hatching done from late summer to most of monsoon.

Signs and Symptoms of Envenomation:**A. Neurological and Neuromuscular:**

These signs and symptoms will usually manifest earliest. Not all of these will necessarily develop, even with severe envenomation.

- Drowsiness
- Eyelid drooping (Ptosis)
- Respiratory paralysis or Dyspnea
- Ophthalmoplegia
- Palatal paralysis
- Glossopharyngeal paralysis
- Limb paralysis
- Convulsions
- Head drooping (Cervical muscle paresis or paralysis)
- Headache
- Sudden loss of consciousness
- Stumbling gait (Ataxia)

B. General:

These symptoms typically manifest within one to four hours following the bite.

- Nausea and Vomiting
- Hypotension

- Flushing of the face
- Warm skin
- Pain around bite site
- Abdominal Pain

C. Cardiotoxicity:

- Increased blood pressure and increased cardiac output followed by myocardial depression and asystole.
- Mortality approaches 100% if cardiotoxic complications occur.

D. Local Symptoms:

- In some Cobra bites, local tissue destruction and necrosis can dominate the clinical presentation.
- Gangrene requiring amputation can occur.
- Local tissue damage appears to be less frequent and less severe in most cases of Indian cobra (*Naja naja*) envenomation, but may include localized discoloration of skin, vesiculation, necrosis and local edema.

E. Fang Marks:

- Fang marks may be present as one or more well defined punctures, as a series of small lacerations or scratches, or there may not be any noticeable or obvious markings where the bite occurred.
- The absence of fang marks does not preclude the possibility of a bite.
- In general, the fang marks from an Indian Cobra tend to be small, but deep.
- The snake in delivering the bite may hold on and chew savagely, and may inject up to 60% of its venom.
- Multiple bites inflicted by a single snake or by more than one snake are also possible, and should be noted if present.

Medical Management:

- A. Admit patient to an emergency or trauma service.
- B. Begin a peripheral intravenous infusion (16 gauge catheter) of Lactated Ringers Solution at a rate of 250cc/hour.
- C. Draw blood from the unbitten extremity, and collect urine for the following laboratory tests.
 1. Type and cross match two units of whole blood.
 2. CBC with differential.

3. Coagulation Parameters:
 - a. Prothrombin Time (PT)
 - b. Partial thromboplastin time (PTT)
 - c. Platelet count
 - d. Fibrinogen levels
 - e. Fibrin degradation products
 4. Serum Electrolytes, BUN/Creatinine, calcium, phosphorus.
 5. Lactate Dehydrogenase (with Isoenzyme analysis). Isoenzyme analysis may indicate multiple targets of the venom components which may dictate further management.
 6. Urinalysis (Macroscopic and Microscopic Analysis) for Free protein and hemoglobin
 7. Electrocardiogram (Place the patient on continuous monitoring).
 8. Additional tests as needed or indicated by patient's hospital course.
- It may be necessary or practical to repeat some or all of the above serum and urine tests periodically over the hospital course to monitor the effects of antivenom therapy or to detect late changes in parametric values.

D. Observation:

- Observe the patient closely for signs and symptoms of envenomation which usually manifest between 15 minutes and two hours following the bite.
- If no signs or symptoms have been noted after two hours, there is the possibility that the patient received a dry bite (no venom injected).
- Very slowly begin to remove the bandages and splint watching carefully for any changes in the patient's status. If any changes occur, assume the patient has been envenomed and prepare to give antivenom immediately.
- If signs and symptoms still fail to manifest, continue close observation of the patient for an additional 24 hours.
- If any sign or symptom becomes apparent or has been noted during the course of evaluation, begin anti venom therapy.

Anti Venom Therapy:

- Each vial of Polyvalent Antivenom is usually packaged as a lyophilized dry preparation in a glass vial with an accompanying vial of sterile water.
- It is preferable to reconstitute the antivenom in ringer lactate solution. TWO vials of antivenom are to be used as the initial dose. Carefully score both vials, and break open. Withdraw the sterile water or 20 ml of room temperature lactated ringers solution into a sterile syringe, and then transfer 10 ml to each antivenom vial.

- Carefully mix and reconstitute the antivenom in each vial, allow the vials to stand still for one minute to clear, withdraw the clear solution into a clean sterile syringe (leaving froth and undissolved particles behind), and prepare to transfer to intravenous piggyback set-up.
- Administer the reconstituted antivenom intravenously over a period of 20 minutes at a rate of 1 vial per 10 minutes (i.e., 1.0 ml per minute).
- Should any signs of allergy/anaphylaxis like coughing, dyspnea, urticaria, itching, increased oral secretions, etc. develop, immediately discontinue the administration of antivenom, and treat symptoms with epinephrine, steroids and antihistamines. As soon as the patient is stabilized, continue the antivenom infusion at a slower rate.
- After the first two vials of antivenom have been administered, the splint and the bandages may be removed. This should be done very slowly over a five minute period to prevent a bolus release of venom. If the patient's condition worsens:
 - a. Reapply the crepe bandage.
 - b. Prepare a third vial of antivenom (1 vial in 10 mls of Lactated Ringers Solution) immediately as directed above.
 - c. Infuse this dose at 1.0 ml per minute for 10 minutes.
 - d. Release the bandage again slowly over 5 minutes.
- In any case, an additional vial of antivenom should be prepared and allowed to dissolve fully. Anticipate giving this next dose approximately two hours after the first two vials has been delivered. If the patient's symptoms should persist or worsen, administer this dose 60 or 90 minutes following the first dose or doses.
- Antivenom therapy is the main stay of treatment for cobra envenomation. Many of the symptoms are almost decreased or entirely eliminated by the antivenom alone. Other symptoms will require additional modalities of therapy to correct.
- Local symptoms may take several days to weeks to completely resolve; their progression, however, may be treated with antivenom therapy.
- Neurological Symptoms (especially respiratory obstruction or failure) are usually the most immediate cause of dangerous problems. Often, these are improved by the antivenom. If breathing becomes impaired, provide respiratory assistance
- Haematological symptoms if present are treated as disseminated intravascular coagulopathy.
- Renal symptoms are rare in cobra envenomation and if severe may necessitate peritoneal dialysis.

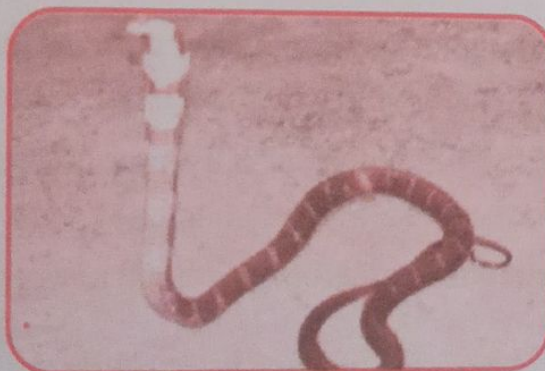
- If severe muscle paralysis develops and persists, administer 0.6 mg of Atropine IV followed by giving 0.5 mg of Neostigmine IV every 30 minutes for a maximum of five doses.
- It is important to keep venom neutralization current and continuous. The best method to accomplish this is to keep a close watch on the patient's status. If the present condition does not improve, or should it worsen for any reason, additional antivenom should be administered. One should anticipate using 3-5 vials for a minor bite, 10-15 may be necessary for moderate or severe bites.
- The patient should be observed in the hospital for at least 24 hours after symptoms are stabilized.

King Cobra

Scientific Name	:	Ophiophagus hannah
Family	:	Elapidae
Venom Type	:	Neurotoxic

Introduction:

The king cobra is an example of a snake with "cobra" in its name, but it is not a member of the Naja genus. The King cobra is the only member of its genus. It is the longest species of venomous snake in the world. Though they can reach lengths of up to 18 feet, their average length being up to 10 to 13 feet. Though there are other snakes with more potent venom, the amount of neurotoxin that a king cobra can emit in one bite is enough to kill 20 people - or one elephant. Fortunately, king cobras are shy and avoid people. King Cobras are widely distributed from India to many South-east Asian countries.



Taxonomy:

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Reptilia

Order	:	Squamata
Family	:	Elapidae
Genus	:	Ophiophagus
Species	:	O. hannah
Binomial name	:	Ophiophagus hannah

Characteristics for Identification:

Due to very large and heavy body marked with light bands it can be easily identified.

Description:

New born	:	43-50 cm.
Average length	:	300 cm (10ft).
Maximum length	:	5850 cm (19.19ft), individuals above 450 cm (15ft) are not common in India.

Dorsal:

- Body very long, slender and covered with large size smooth scales.
- Dorsal color variable according to geographical locations which includes gray, black, dark olive green, yellowish-brown with yellow or white bands throughout the body.
- Bands of hood region are inverted V shaped and known for having characteristic to recognize each individual.

Ventral:

- Belly color usually pale yellow or grayish with dark shades on edge of many.
- Ventrals underside of hood have extensions of dorsal coloration which is characteristic to recognize different individuals.

Head:

- Head large with rounded snout, covered with large shields and slightly broader than neck.
- Color similar to dorsal scales and usually have no patterns on top; light forms often bear black edge.
- Large eyes have rounded pupil.

Tail:

- Long tail ends with pointed tip. Bands found in dorsal body continue till the end of it.

Scalation:

Head:

- Scalation almost similar like Asian Najas.

- Presence of large occipital scales behind parietal scales is characteristic of this species which are not found in other "Cobras" of Naja genus.

Dorsal:

- Smooth scales in 17/19:15:15 rows.

Ventral:

240-254.

Sub Caudal:

84-104; anterior scales undivided, posterior scales divided.

Habitat:

- Found in the plains and dense rain-forests of India, Southern China and Southeast Asia.
- He can be found either on land, dense forests, up in the trees, bamboo thickets or even in water. The King is a great climber and an excellent swimmer, and his preferred spots are areas with lakes, streams or near swamps.
- His habitat can also include open fields or agricultural areas, mangrove swamps, forests, and grasslands and will usually live an average lifespan of 20 years.

Diet:

- Ophipohagus hannah is a ferocious snake eater.
- Feeds on all other snakes as major prey.
- His favorites are small pythons and rat snakes, but the King will even eat other venomous and poisonous snakes.
- However, when there are no snakes to be found, the King will usually hunt small mammals, monitor lizards, lizards and birds.

Reproduction:

- King Cobras are the only snakes in the world that build a nest for their young.
- The Kings will actually mate during the first three months of the year. After that, the female will use various pieces of vegetation to build a two-room nest, in two layers.
- She will lay around 20-40 eggs in the lower room, and will later use the upper room to safeguard her future offsprings.
- The eggs will be faithfully guarded either by her, or her mate.
- They usually take turns in guarding the nest and hunting.
- The incubation time will last between 60-90 days.

Signs and Symptoms of Envenomation:

- The signs and symptoms will usually manifest earliest, possibly within 15 to 30

minutes following the bite.

- The signs and symptoms and medical management are similar to *Cobra* bite.

Antivenom Therapy:

- There are a few types of antivenom made specifically to treat a King Cobra bite like the Red Cross in Thailand manufactures one (Specific), and the Central Research Institute in India, Kasauli, H.P, manufactures the other (non-specific); however, both are made in small quantities and are not widely available.
- The regular polyvalent antivenom available widely in India is not effective against the king cobra as the venom of king cobra is not involved during its manufacturing.
- Moreover, although very widely distributed over southern Asia, the King Cobra is not often encountered in nature by humans, and is rarely a cause of snake bite accidents.
- The few confirmed attacks by King Cobras in nature have often resulted in rapid death.

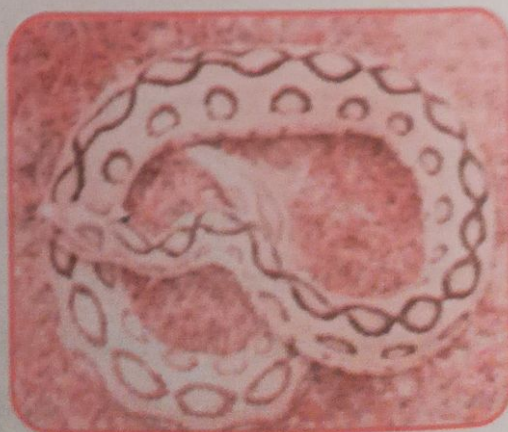
Russell's Viper

Scientific Name	:	<i>Daboia russelii</i>
Family	:	Viperidae
Venom Type	:	Haemotoxic

Introduction:

The species was named in honor of Patrick Russell (1726-1805), a Scottish herpetologist who first described many of India's snakes; and the name of the genus is from the Hindi word meaning "that lies hid", or "the lurker."

The common names of *Daboia* include Russell's viper, chain viper, Indian Russell's viper, common Russell's viper, seven pacer, chain snake, and scissors snake. It is distributed



throughout the country, not found in Indian islands, Himalayan hills and most of the North-states.

Taxonomy:

Kingdom	:	Animalia
Phylum	:	Chordata
Subphylum	:	Vertebrata
Class	:	Reptilia
Order	:	Squamata
Suborder	:	Serpentes
Family	:	Viperidae
Subfamily	:	Viperinae
Genus	:	Daboia Gray, 1842
Species	:	D. russelii

Characteristics for Identification:

- This species can be identified easily by robust and stout body covered with keeled scales.
- Eye or almond like spots are found in whole dorsal body in three rows.
- This snake can grow to a maximum total length (body + tail) of 166 cm (5.5 ft) and averages about 120 cm (4 ft).

Description:

- New born- 24 cm.
- Average length- 100 cm (3.3ft).
- Maximum length- 180 cm (6ft).

Dorsal:

- Body stout, robust and covered with highly keeled pointed and dry looking scales.
- Dorsal light or dark grayish-brown, reddish, orange or entirely gray occasionally.
- Colour and patterns become faint in adults or sometimes adults found to be completely pattern less.
- Continuous or discontinuous eye or almond like hollow or solid spots of dark brown or blackish color present in three longitudinal rows along the body; starts from head and generally become faint or absent on tail side.
- Side spots smaller and more rounded than spots present on the top and generally discontinuous.

Ventral:

- Belly white or light yellow with deep dark brown or blackish semi lunar spots on the

edge of most of ventral scales.

- Underside of tail usually darker (brown or deep yellow) than ventral scales with paired subcaudals.

Head:

- Head triangular, pointed with small keeled scales; clearly broader than neck.
- Two triangular shaped spots of rounded edge present on the top.
- Upper lip pinkish white mostly. Supra nasal crescentic with large nostril.
- Moderate eyes have vertically elliptical pupil.
- Two very long fangs present in front side of mouth from birth.

Tail:

- Small tail with pointed tip and covered with typical keeled scales; usually without patterns.

Scalation

Head:

10-12 supralabials; 10 to 15 small size scales around eyes.

Dorsal:

Highly keeled scales in 25-29:27-33:21-23 rows.

Ventral:

153-180; anal undivided.

Sub Caudal:

41-64; divided.

Habitat:

- Found both in plains and moderate elevation up to approximately 4800 ft; more common in plains.
- Distributed in variety of forests including rainforest, mixed, dry, moist deciduous forest, scrub lands, grassland, wetland etc.
- Habitat includes dry open lands, agricultural fields, open country, scrubs having low bushes, rocky terrain having mounds & vegetation etc. Hides in mounds, holes, piles, caves, cracks, dense leaf litters, dense vegetation etc.

Natural History:

- Russell's viper is a nocturnal species which choose nights for foraging and other life activities.
- Seen at daytime during basking which can retain for most of the day during winters.

- Shows terrestrial activity and choose drier surrounding.
- Locomotion usually slow but creeps in somewhat jumpy manner after threatening.
- Behavior alert and aggressive if one comes under its attacking range or sitting site.
- On provocation make a plate like rounded coil with head at center and produce whistle or pressure cooker like sound to alarm its enemy.

Diet:

- Feeds chiefly on rodents and small mammals; also feeds on birds, lizards, frogs.

Reproduction:

- This species is ovoviviparous; female directly gives birth to 6-96 young during summer to monsoon months.
- However many are usually born dead or die after few hours of birth due to lack of proper nutrition and lack of proper development during gestation.
- Mating generally occurs early in the year, and the gestation period is more than six months. Young are produced from May to November, but mostly in June and July.

Signs and Symptoms of Envenomation:

The bite of *Vipera russelli* is responsible for the majority of snakebite incidents in India. These signs and symptoms will usually manifest earliest, though their development will vary considerably from case to case. Not all of these will necessarily occur, even with severe envenomation.

A. General Symptoms:

- Local pain at bite site
- Pain in regional lymph nodes
- Vomiting
- Bleeding from distant sites
- Drowsiness
- Epigastric pain
- Lower back pain
- Dizziness/impaired consciousness

B. Systemic Envenomation:

- Spontaneous systemic bleeding
- Hypotension
- Conjunctival edema

- Bleeding from gums
- Bleeding from venipuncture sites
- Hematemesis
- Melena
- Bleeding from incisions
- Subconjunctival hemorrhage
- Epistaxis

C. Local:

- Local swelling
- Tender, enlarged lymph nodes
- Bleeding at bite site
- Local blistering and necrosis

D. Neurological & Muscle Signs:

- Bilateral ptosis, generalized muscle pain & tenderness
- External ophthalmoplegia
- Dysphagia
- Dysarthria

E. Hematology:

- Generally *Vipera russelli* venom shows both procoagulant (Factor V, IX, & X activation) enzyme activity and direct fibrinolytic activity.
- This presents as a DIC-type coagulopathy, and results in non coagulating blood and hemorrhage.
- Fibrinogen, platelet counts, and hemoglobin levels are generally decreased.
- A fall in albumin may also be expected secondary to a generalized increase in capillary permeability.

F. Urinary Symptoms and Renal Failure:

- Hematuria
- BUN range
- Proteinuria (>1 gm/liter)
- RBC casts
- Oliguria
- Renal-angle tenderness

G. Fang Marks:

- Fang marks may be present as one or more well defined punctures, as a series of small lacerations, or scratches, or there may not be any noticeable or obvious markings where the bite occurred.
- The absence of fang marks does not preclude the possibility of a bite (especially if a juvenile snake is involved).
- Multiple bites inflicted by a single snake are also possible, and should be noted if present.

H. Severe Envenomation:

One or more of the following clinical pictures can occur:

- a) Hypotension and increased heart rate secondary to peripheral circulatory collapse.
- b) Acute Renal Failure secondary to acute tubular necrosis.
- c) Internal bleeding secondary to DIC.
- d) Neurological symptoms including ptosis, external ophthalmoplegia, and dysphagia.

Medical Management:

The management is same as described in cobra bite. In the lab investigations, apart from the ones described myoglobin and casts are also to be considered in urine analysis.

Antivenom Therapy:

- After following proper skin testing precautions, reconstitute the contents of 2 vials of polyvalent antivenom. The method of administration of antivenom is same as described in cobra bite.
- The dose range for mild to severe bites is 2-8 vials.

Symptomatic Treatment:

- Cardiovascular symptoms are usually seen only in systemic envenomation.
- They usually present as hypotension and increased heart rate.
- Patients should be treated for peripheral circulatory collapse by continuing peripheral I.V. infusion of Lactated Ringers at 250 cc/hr and administering vasopressors and volume expanders.
- The rest of the symptomatic treatments are same as described in cobra bite.

General Considerations:

- It is important that the patient be placed at rest, kept warm, and avoid unnecessary movement.
- The variability of symptoms in viper envenomation can be great so it is important to

note the continual progression of symptoms throughout the course of therapy, and give additional antivenom as necessary to titrate these symptoms.

- Fluid management is very important in snakebite cases, so the patient should be well hydrated and a brisk urine output maintained.
- Morphine is contraindicated because of its tendency to suppress respiration and alcohol should also be avoided.
- In cases where Circulatory Shock remains uncorrected by antivenom therapy, plasma volume expanders and/or vasop-ressor agents may be given with appropriate considerations.
- If the patient remains oligoanuric, peritoneal dialysis should be considered early.
- Tetanus prophylaxis should be current.
- Antibiotics are NOT recommended prophylactically.

Special Considerations:

A. Local Necrosis: Prompt delivery of antivenom following the bite may lessen the extent of local tissue damage.

B. Multiple Bites:

- It is possible for *Vipera* to deliver more than one bite in a single attack and thus may inject a large volume of venom.
- If there is evidence that such an attack occurred, twice the initial dose of antivenom should be given - i.e. 4 vials over 40 minutes at the rate of one vial per 10 minutes.
- Always watch closely for signs of allergic response; if they occur, treat appropriately and with a slower infusion rate.
- Give all subsequent doses in one vial increments at a rate of 1 vial per 10 minutes as necessitated by the presence of continued signs and symptoms.

C. Severe Envenomation:

- If the patient shows severe signs of envenomation, particularly if early after the bite, treat as a multiple bite, administering 4 vials of antivenom over the first 40 minutes and give all subsequent doses in one vial increments at a rate of 1 vial/10 minutes as necessitated by the presence of continued signs and symptoms.

D. Neurological Manifestations:

- The onset of neurotoxic symptoms can be rapid and subtle, but usually mild and transient.
- It may be necessary to wake the patient and perform a brief neurological check every

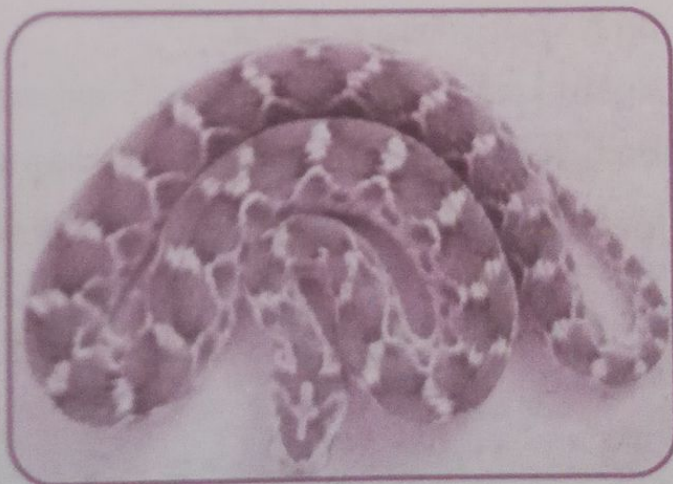
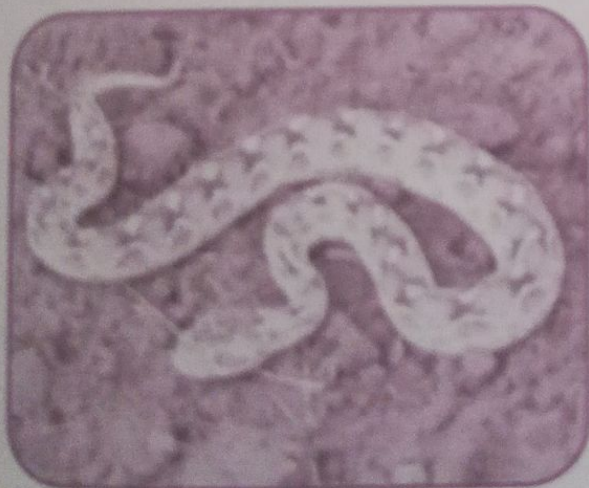
- hour or so to assure that breathing and other neurological functions are not impaired.
- If the patient should develop difficulties in breathing or airway management, respiratory support will be required.
 - If the tongue, jaw, or pharynx becomes paralyzed, insert an oral airway or intubation may be required.
 - If any signs of Oropharyngeal paralysis or impaired swallowing exist, give nothing by mouth, and keep patient on his side with head down.
 - Watch for airway compromise and aspiration.

Saw Scaled Viper

Scientific Name	:	Echis carinatus
Family	:	Viperidae
Venom Type	:	Hemotoxic

Introduction

Saw-scaled vipers are relatively small snakes. The head is relatively small and is short, wide, pear-shaped and distinct from the neck. The snout is short and rounded, while the eyes are relatively large and the body is moderately slender and cylindrical. All members of this genus have a distinctive threat display, which involves forming a series of parallel, C-shaped coils and rubbing them together to produce a sizzling sound, rather like water on a hot plate.



The proper term for this is stridulation. As they become more agitated, this stridulating behavior becomes faster and louder. Distributed throughout the Indian mainland except most of the West Bengal and eastwards states; above Gangetic plains, Himalayan foothills, Indian Islands.

Taxonomy:

Kingdom	:	Animalia
Phylum	:	Chordata
Subphylum	:	Vertebrata
Class	:	Reptilia
Order	:	Squamata
Suborder	:	Serpentes
Family	:	Viperidae
Subfamily	:	Viperinae
Genus	:	Echis.

Characteristics for Identification:

- It can be identified by carefully checking very dry looking body covered with rough scales, light color rounded patches on top which are surrounded by two wavy lines from head to posterior body.

Description:

- New born- 8cm.
- Average length- 30cm.
- Maximum length- 80cm.

Dorsal:

- Body short, robust and stout.
- Highly keeled pointed scales of dry appearance found in all over the dorsal body.
- Body color ranges from light to dark brown, gray, brick red or reddish-brown.
- Light color spots of light yellow or very light brown margined by dark color found in whole dorsal surface; these spots may be more symmetric on mid body; usually guarded and connected by two undulating lines from both sides (head to posterior body).

Ventral:

- Belly color white with dark brown or blackish spots in all ventral scales; these spots become larger and more prominent on side ventrals.
- Subcaudal scales undivided.

Head:

- Head triangular with small shaped keeled scale; clearly broader than neck.

- One arrow or cruciform shaped or somewhat plus shaped mark always exist on the top of the head which may have long or short arms.
- Large eyes with vertical pupil.
- Two long foldable fangs present on the fore side of the mouth in all life stages.

Tail:

Short tail with a pointed tip, covered with keeled scales; typical dorsal patterns may be absent or faint.

Scalation**Head:**

- 10-12 supralabials (4th largest)
- 10-15 small size scales around eyes (excluding supraocular)
- 3-4 scales between nasal and eyes; 8-12 scales between supraoculars.

Dorsal:

- Highly keeled scales in 25-29: 27-37: 21-27 rows
- Obliquely arranged scales in 4-7 rows (these are responsible for its famous saw like sound due to mutual rubbing of side dorsals).

Ventral:

132-185; anal divided or undivided.

Sub Caudal:

23-39; undivided.

Habitat:

- Found both in moderate elevation and plains.
- Distributed in variety of forests including deserts, semi-deserts, rainforest, scrub forest, mixed, dry and moist deciduous forest, grassland etc.
- Habitat includes dry open lands, agricultural field, scrubs, rocky terrain, open plains etc.
- Hides in mounds, holes, piles, caves, cracks, dense leaf litters, rocks etc.

Natural History:

- Saw-scaled Viper is a nocturnal species which remains active from late evening to late nights for foraging and other life activities.
- Activity usually terrestrial but climbs on scrub vegetation for basking.
- Locomotion slow and use side winding motion for creeping faster.

- Behaviour very alert, aggressive and quick to respond.
- This is one of the fastest striking snake and on provocation it makes a specific coil to keep the head on front and middle of the coil which is followed by mutual rubbing of oblique scales present on flank and this rubbing produce fascinating sound of "working of saw".
- Strikes very fast when enemy approaches to its attacking range and delivers small but very potent amount of venom even by scratching only.
- Mating season starts with male combats.
- Reproduction ovoviviparous, female directly gives birth to 6-8 young individuals during summer to monsoon months.

Diet:

- Feeds on rodents, lizards, frogs, rarely on other snakes, insects including scorpions.

Reproduction:

- The population in India is ovoviviparous.
- In northern India, mating takes place in the winter with live young being born from April to August.
- Occasionally, births have also been recorded in other months.

Signs and Symptoms of Envenomation:

- Severe envenoming is possible, potentially lethal.

Local Effects:

- Marked local effects include pain, severe swelling, bruising, blistering and moderate to severe necrosis may be seen.

Systemic Effects:

- Variable non-specific effects may be seen including headache, nausea, vomiting, abdominal pain, diarrhoea, dizziness, collapse or convulsions.
- Neurotoxic paralysis and myotoxicity does not occur, based on current clinical evidench.
- Coagulopathy & haemorrhages are common and may be moderate to severe.
- Renal damage is a recognized complication, usually secondady to coagulopathy.
- Cardiotoxicity is unlikely to occur.
- Shock secondary to fluid shifts due to local tissue injury is likely in severe cases

Medical Management:

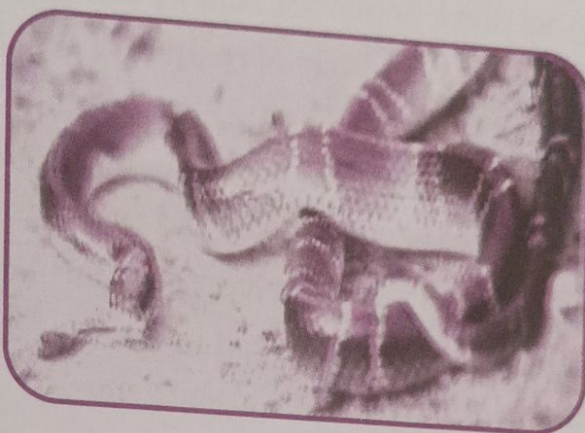
The line of treatment of saw scaled viper is similar to that of Russel's viper.

Common Krait

Scientific Name	: Bungarus caeruleus
Family	: Elapidae
Venom Type	: Neurotoxic

Introduction:

The common krait (*Bungarus caeruleus*), also known as Indian krait or blue krait is a species of venomous snake of the genus *Bungarus* found in the jungles of the Indian subcontinent. The average length is 0.9 m (3.0 ft), but they can grow to 1.75 m (5 ft 9 in).



Males are longer, with proportionately longer tails. The head is flat and the neck hardly evident. The body is cylindrical, tapering towards the tail. Colouration is generally black or bluish black, with about 40 thin, white crossbars which may be indistinct or absent anteriorly.

It is distributed all over India including the North-eastern states, except the Islands.

Taxonomy:

Kingdom	:	Animalia
Phylum	:	Chordata
Subphylum	:	Vertebrata
Class	:	Reptilia
Order	:	Squamata
Suborder	:	Serpentes
Family	:	Elapidae
Genus	:	Bungarus
Species	:	B. caeruleus

Characteristics for Identification:

- Shiny Black body with milky white bands (paired or unpaired).

- Vertebral scales are hexagonal in shape.
- On closer view they can be observed clearly.

Description:

- New born - 25-27 cm.
- Average length- 90-120 cm.
- Maximum length- 165cm.

Dorsal:

- Body slender with shiny smooth scales of black colour range.
- Dorsal body jet black or black mixed with brown, grey, purple tinge.
- Presence of milky white bands (paired or unpaired) on the dorsal body is the main visible feature of Common Krait.
- These bands starts from posterior of neck scale in the form of elongated white patch on the back scale and expands as true band on moving towards the mid-body.
- Specimens without bands also recorded from many parts of its range.
- The vertebral scales are hexagonal in shape as in all Krait species and this is a definite identification feature of this snake and genus.

Ventral:

- Belly milky white in juveniles and sub-adults while may turn yellowish-white in fully grown adults.
- Reddish, brown or bluish tinge present on the edge of ventral scales which extends up to first few dorsal scales.
- Sub caudal scale colour similar to rest of belly and unpaired which is also a main characteristic of Bungarus (Krait) genus and not found in any other Elapid of India.

Head:

- Head depressed with rounded snout; slightly broader than the neck.
- Upper lip brownish or yellowish and preocular scale often bear yellowish-white patch.
- Small eyes appears entirely black.
- Tongue colour light red or pinkish.

Tail:

- Prehensile, shorter and ends with pointed tip.
- Typical white bands are present and more prominent than those found in fore body.

Scalation

Head:

- 7 supralabials; 3rd & 4th in contact with eyes; 1 preocular touches posterior nasal hence

loreal absent; 2 postocular; temporals 1+2.

Dorsal:

- Smooth scales in 15 rows throughout.
- 8th scale which is on the top of the dorsal body along the vertebra is larger than adjacent dorsal scales and of hexagonal shape.

Ventral:

- 200-217 (234); anal undivided (entire).

Sub Caudal:

- 33-52 and undivided.

Habitat:

- Distributed in variety of forests including rainforest; dry, moist, mixed deciduous forest, scrub forest, wetlands, grasslands etc.
- Lives in almost all kinds of habitat suitable for snakes and wide range of elevations (plains and hills); this includes urban settlement, dense & open forest, hills, agricultural lands, rocky terrain etc.
- Prefers wet surrounding for activity.

Natural History:

- Common Krait is exclusively a nocturnal species and shows activity from late evening to early morning.
- Activity usually terrestrial but climbs well on rough surfaces in search of prey and hide.
- Remain hidden in dark and silent places like rat holes, termite mounds, variety of caves, old tree mounds, under rocks etc. during day time.
- Behavior shy and usually non-offensive.
- At day time it become quite docile and less resisting while at night it becomes aggressive, sharp and alert for foraging.
- In defensive response it makes call like coil of body and try to hide its head under it.
- Flattens its most of the body on ground in aggression and can bite on further disturbance.

Diet:

- Feeds majorly on other snakes and rodents. Also feeds on frogs, toads and lizards.

Reproduction:

- Mating season begins with summer and female lays eggs in mound, holes, dense & dry leaf litters etc. in very secretive manner.
- Hatching occurs during start of monsoon mostly. Male combat also observed in this species during post winter and summer months.

Banded Krait

Scientific Name	:	Bungarus fasciatus
Family	:	Elapidae
Venom Type	:	Neurotoxic

Taxonomy:

Kingdom	:	Animalia
Phylum	:	Chordata
Subphylum	:	Vertebrata
Class	:	Reptilia
Order	:	Squamata
Suborder	:	Serpentes
Family	:	Elapidae
Genus	:	Bungarus
Species	:	B. fasciatus.

**Characteristics for Identification:**

- Due to its unique external morphology of bearing alternative black and yellow bands on dorsal and belly portions it can be easily identified without any confusion.

Description:

- New born- 25-40cm.
- Average length- 150cm (5ft).
- Maximum length- 225cm.

Dorsal:

- Body triangular with alternate yellow, yellowish-brown and black broad bands of almost the same breadth (or black bands broader than yellow).
- In new born the yellow colour is faint or completely white.
- Top scale row hexagonal in shape which is much larger than rest of dorsal scales.

Ventral:

- Belly with same color and patterns like adjacent dorsal bands but in dull form.

Head:

- Head triangular with rounded edges and not depressed.
- Color shiny black and yellow alternatively; snout black followed by narrow oblique streaks of yellow and on posterior side it is continued till nape by black.
- Moderate eyes with rounded pupil look entirely black in live state.

Tail:

- Shorter than a typical snake with blunt end, bands continues till the end of the tail.

Scalation:**Head:**

- 7 supralabials, 3rd & 4th in contact with eyes; preocular 1, in contact with posterior nasal hence loreal absent; postocular 2; temporal 1+2.

Dorsal:

- Smooth scales in 15 rows throughout; 8th scale which is at the top of the dorsal surface (vertebral series) is larger than rest of the dorsal scales and have hexagonal shape.

Ventral:

200-236; anal undivided.

Sub Caudal:

23-39; undivided.

Habitat:

- Lives in and around wet lands, open forests, agricultural lands having low vegetation and open water bodies etc.
- Strictly prefers wet surrounding for its activities.
- Usually found in plains of low to moderate elevations but in many parts of its range it is found in elevation up to 5000ft.

Natural History:

- Banded Krait is a nocturnal species and can be seen during early morning also.
- Activity semi-aquatic and terrestrial.
- Remain hidden in mounds, under wood logs, piles near water bodies at day time.
- Locomotion slower on land but creeps well in wet ground.
- Behaviour shy and usually non-offensive.
- At day time it becomes quite docile and less resisting while at night during foraging time it becomes sharp and alert but bites given in aggression are rare.

- In defensive response it makes "8" shaped loose coil with head under the body, transversely inflates whole body and regularly jerk whole body to charge its enemy.

Diet:

- Feeds mainly on other snakes including venomous ones like Cobras; also feeds on fishes, frogs, rodents etc.

Reproduction:

- Mating begins from late winters to summer months.
- Female lays about 15 eggs in mounds, tree caves, cavities of wooden logs around water bodies.
- New born individuals seen during starting of monsoon.

Signs and Symptoms of Envenomation:

A. Neurologic/Neuromuscular: These signs and symptoms will usually manifest earliest. Not all of these will necessarily develop, even with severe envenomation.

- Ptosis
- Glossopharyngeal palsy (dysphagia)
- Ophthalmoplegia
- Strabismus, blurring vision
- Pupils dilated
- Proximal limb paralysis
- Intercostal & diaphragmatic paralysis (respiratory failure)
- Increased oral secretion
- Ataxia
- Headache
- Drowsiness
- Coma

B. General:

- These symptoms typically manifest within one to three hours, though for Kraits it can be up to 12 hours following the bite.
- Abdominal pain is usually moderate to severe and confined to the epigastrium, but can be generalized.
- Diffuse muscle tenderness rarely occurs.

C. Hematology:

- One may expect a polymorph leucocytosis.

D. Cardiotoxicity:

- A small amount of cardio toxin is present in Indian Krait snake venom, but usually demonstrates no heart manifestations.
- A transient decrease in arterial pressure without further changes has been reported.

E. Local Symptoms:

- In Krait bites, there are rarely any local symptoms.
- Local tissue destruction and necrosis may rarely appear.
- One can find minimal edema and pain at the bite site.

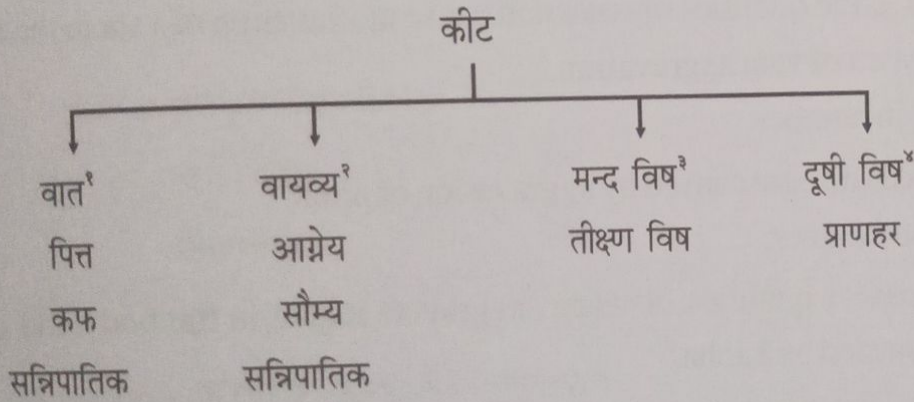
Medical Management:

- The lab investigations and medical management of krait poisoning is similar to that of cobra bite.

कीट विष**Origin/ उत्पत्ति:**

सर्पणामेव विण्मूत्र शुक्राण्ड शव कोथजाः । (अ.ह.उ. ३७/१)

Keeta are born from the putrified urine, faeces, semen, egg and cadaver of snakes.

Types**कीट दंश लक्षण- Signs and Symptoms of Keeta Damsha:****A. According to Dosha^५:****१. वातज कीट**

दंश तोद	-	pricking pain
रुज उल्बण	-	increasing pain at bite site.

१. दोषैर्व्यस्तैः समस्तैश्च युक्ताः कीटाश्चतुर्विधाः । (अ.ह.उ. ३७/१)

२. वाय्वग्न्यम्बुप्रकृतयः कीटास्तु विविधाः स्मृताः ।

सर्वदोष प्रकृतिभिर्युक्तास्ते परिणामतः ॥ (सु.स.क. ८/३)

(सु.क. ८/२३)

३.लिङ्गं तीक्ष्ण विषेष्वेत.....च्छृणु मन्दविषेष्वतः.....॥

४. दूषीविषाः प्राणहरा इति संक्षेपतो मताः ॥ (च.चि. २३/१४०)

५. दृष्टस्य कीटर्वायव्यैदंशस्तोद रुजोल्बण । आग्नेयैरल्पसंस्त्रावो दाहराग विसर्पवान् । पक्व पीलु फल प्रख्यः खर्जूर सदृशोथवा ॥

कफाधिकैर्मन्दरुजः पक्वोदुम्बर सन्निभः । स्त्रावाढयः सर्वलिङ्गस्तुदंशः स्यात्सन्निपातिकैः ।

(अ.सं.उ. ४३/१३)

२. पित्तज कीट

अल्प संस्नाव	- slight exudation
दाह	- severe burning sensation
राग	- redness
विसर्पवान्	- spreading in nature
पक्वपीलु फल प्रख्य	- resembling a ripe fruit of pilu
खर्जूर सदृश	- or resembling kharjura

३. कफज कीट

मन्द रुज	- mild pain
पक्वोदुम्बर सन्निभ	- swelling resembling a ripe udumbara fruit.

४. सन्निपातज कीट

स्त्रावाढयः	- copious exudation
सर्वलिङ्गस्तु	- symptoms of all the doshas.

B. According to the Qualities they Possess:**१. वायव्य-** Are 18 in number.

These insects have the qualities of vayu and cause aggravation of vata in the body; bite by these produce diseases of vata aggravation.¹

२. आग्नेय- Are 24 in number.

Their bite produces disease caused by aggravation of pitta.²

३. सौम्य- Are 13 in number.

These insects possess qualities of water, aggravate kapha in the body and their bite gives rise to diseases caused by kapha.³

४. सन्निपातिक- Are 12 in number

They cause loss of life, bitten by these, stages of poisoning are similar to those of snakes, symptoms are those produced by the aggravated dosa and severe diseases are caused by their bite.⁴

C. According to its Sevearity:**१. मन्द विष कीट-**

These insects produce the following signs and symptoms according to the dosa aggravated.

१. अष्टादशेति वायव्याः कीटा वातप्रकोपनाः । (अ.सं.उ. ४३/३)
२. चतुर्विंशतिराग्नेयाः कीटाः पित्तविकारदाः । (अ.सं.उ. ४३/४)
३. त्रयोदशैते निर्दिष्टाः सौम्याः श्लेष्मप्रकोपनाः । (अ.सं.उ. ४३/५)
४.सङ्कीर्णा द्वादश प्राणनाशनाः । (अ.सं.उ. ४३/६)
५. प्रसेकारोचकच्छर्दिशिरोगौरवशीतकाः । पिडकाकोठकण्डूनां जन्म दोषविभागतः ॥ (सु.क. ८/२३)

प्रसेक	-	salivation
अरोचक	-	loss of taste
छर्दि	-	vomiting
शिरोगौरव	-	feeling of heavyness of head
शीतका	-	cold shivers
पिडका	-	appearance of eruptions
कोठ	-	rashes
कण्डू	-	itching

२. तीक्ष्ण विष कीट^१:

The following signs and symptoms are seen in poisoning by teekshna visha keeta.

ज्वर	-	fever	दाह	-	burning sensation
अङ्गमर्द	-	bodyache	मूर्च्छा	-	fainting
रोमाञ्च	-	horripilation	विजृम्भिका	-	more of yawning
वेदन	-	discomforts/pain	वेपथु	-	rigors
छर्दि	-	vomiting	श्वास	-	dyspnoea
अतीसार	-	diarrhoea	हिक्का	-	hiccup
दारुण शीत	-	severe chills			
पिडकोपचय	-	development of erruptions			
शोफ	-	oedema			
ग्रन्थयो	-	glandular enlargement			
मण्डल	-	appearance of coloured round patches			
दद्रव कर्णिका	-	different lesions of skin			
विसर्पा, किटिभ					

१. ज्वराङ्गमर्द रोमाञ्चवेदनाभिः समन्वितः। छर्द्यतीसार तृष्णाश्च दाहो मूर्च्छा विजृम्भिका॥
वेपथु श्वास हिक्काश्च दाहः शीतं च दारुणम्। पिडकोपचयः शोफो ग्रन्थयो मण्डलानि च।
दद्रवः कर्णिकाश्चैव विसर्पाः किटिभानि च। तैर्भवन्तीह दष्टानां यथास्वं चायुपद्रवाः॥ (सु. क. ८/२१)

D) According to Nature of Poison:

१. दूषीविषा: कीटा^१ -

The signs and symptoms produced by the bite of dooshi visha keeta include.

गात्र रक्तं, सितं, कृष्णं श्यावं वा - Red, white, black or brownish black discolouration of the part of the body which is bitten.

पिडकान्वितम् - bite site develops small eruptions like a pimple.

सकण्डू - itching

दाह - burning sensation

वीसर्प - erysipelas

पाक - suppuration

कुथितं तथा - sloughing

२. प्राणहर कीट^२:

सर्पदष्टे यथा शोथो वर्धते - expanding oedema, as in snake bite.

उग्रगंधी - associated with strong smell

असृक् - bleeding

दंशो अक्षिगौरवं - heaviness of eyes

मूर्च्छा - fainting

रुगार्त - pain

श्वसित्यपि - dyspnoea

तृष्णा - thirst

अरुचि - anorexia

E) According to Presence or Absence of Poison:

१. सविष कीट लक्षण^३:

If the signs and symptoms include the following, it is considered as सविष कीट दंश

कण्डू	- itching	दाह	- burning sensation
निस्तोद	- piercing pain	राग	- redness
वैवर्ण्य	- discolouration of skin	रुक्	- pain

१. गात्रं रक्तं सितं कृष्णं श्यावं वा पिडकान्वितम्।

सकण्डू दाह वीसर्प पाकि स्यात् कुथितं तथा कीटैर्दूषी विषैर्दुष्टं॥ (च.चि. २३/१४०)

२.लिङ्गं प्राणहरं शृणु। सर्पदष्टे यथा शोथो वर्धते सोऽग्रगन्धसृक्॥

दंशो अक्षिगौरवं मूर्च्छा स रुगार्तः श्वसित्यपि। तृष्णा अरुचि परीतश्च भवेद्॥ (च.चि. २३/१४३)

३. कण्डू निस्तोद वैवर्ण्यं सुप्तिं क्लेद उपशोषणम्। विदाह राग रुक्पाकाः शोफो ग्रन्थि निकुञ्चनम्॥

दंशावदरणं स्फोटः कर्णिका मण्डलानि च। ज्वरश्च सविषे लिङ्गं विपरीतं तु निर्विषे॥ (च.चि. २३/१७७-७८)

सुप्ति	- numbness	पाक	- suppuration
क्लेद	- moistening	शोफ	- oedema
शोष	- dryness	ग्रन्थि	- formation of cysts
दंशावदरण-	tearing of the bite site	निकुञ्चन	- shrivelling/shrink
कर्णिका	- polyp	स्फोट	- pustular eruptions
ज्वर	- fever	मण्डल	- circular patches

निर्विष कीटः

These possess the opposite qualities of the above.

Signs and Symptoms and Treatment of Individual Variety of Keeta :

Type	Number	Sings of Presentation	Treatment
कणभा (wasp)	4	• तीव्र वेदन-severe pain. • श्वयथु- swelling • मर्दोगुरुता गात्राणां- bodyache and feeling of heavy-ness of body • दंश कृष्णश्च- site of bite will be black	कुष्ठ, वक्र, वचा, पाठा, बिल्वमूल, सुवर्चिका, गृहधूम, हरिद्र, दारुहरिद्रा all together.
मक्षिका	6	• श्यावपिडक-blue eruption • उपद्रवाश्च ज्वरादयो- complications like fever • प्राणहर- loss of life	Application of paste of black mud of anthill made with गोमूत्र (cow's urine)
मशका (mosquito)	5	• तीव्र कण्डू- severe itching • दंशशोफ- swelling at the site of bite	Same as makshika
शतपदी (centipede)	8	• शोफ- swelling • वेदना- pain • दाह- burning sensation • मूर्च्छा- fainting • श्वेतपिडक- white coloured eruptions	कुङ्कुम, तगर, शिग्रु, पद्मकं, रजनीद्वय- macerated in water.
मण्डूक (frog)	8	• कण्डू- itching • पीतफेनागमश्च वक्त्रात्- exudation of yellow froth from the mouth. • दाह- burning sensation	मेषशृङ्गी, पाठा, निचुलो, रोहिणी, जल- all together is the antidote for poison of मण्डूक bite.

Type	Number	Signs of Presentation	Treatment
पिपीलिका (ant)	6	• मूर्च्छा- fainting • श्वयथु- swelling • अग्निस्पर्शवत् दाह- burning as though touched by fire • शोफ- oedema at the site of bite	गोमूत्रेण युतो लेपः कुष्णवल्लीकमृत्तिका- application of paste of black mud of ant hill with गोमूत्र
गोधेरक (garden lizard)	5	• शोफ:- swelling • दाह- burning sensation • रुज- pain • ग्रन्थि- development of glandular enlargement • ज्वर- fever	
गल- गोलिका	6	• दाह- burning sensation • शोफ- swelling • क्लेद- exudation at the site of bite • हृदय पीड- pain in area of heart • अतिसार- diarrhoea	रजनी, अगारधूम, वक्र, कुष्ठ, पलाश all together
जलौक (leeches)	6	• कण्डू- Itching • शोथ- swelling • ज्वर- fever • मूर्च्छा- fainting	All antidotes prescribed for treatment of insect bite.

Insects:

- There are about 3-30 million different species of insects.
- The largest phylum 'Arthropoda' consists of three subphyla, comprising nine classes.
- Class Insecta is the largest of the arthropod classes, containing twenty orders and hundreds of species which can be either venomous or non venomous.
- The Venomous stingers include the bees, wasps, hornets, fire ants, yellow jackets etc whereas the Non-venomous biters include the mosquitoes, fleas, ticks, lice, scabies, bed bugs etc.

Makshika- Honey Bee



- At the rear end of bees, there is a sharp, pointed barbed stinger, which the bee will stick something with and release venom into its victim.
- The stinger can be thought of as a sort of syringe, sharp, hollow tube.
- When a bee stings, it injects a venomous fluid under the skin.
- Only the honeybee leaves her stinger, with its venom sac attached in the skin of its victim.
- Since it takes two to three minutes for the venom sac to inject all its venom, instant removal of the stinger and sac usually reduces harmful effects.
- Bees produce venom as a self-defense mechanism to protect themselves and their hives.
- It is synthesized in the venom glands of worker and queen bees and stored in their venom sacs.
- During the stinging process it is expressed through the sting apparatus.
- Bee venom is between 88% water and the dry venom has 50% mellitin (a 26 amino-acid peptide), 15% enzymes (called phospholipase A and hyaluronidase), 2% apamin and 5% histamine.
- The various components of the venom attack and act on different parts of the body.
- When one is stung it is shortly followed by intense pain, swelling and reddening of the site where one was stung.
- In the center of a bee sting you see a small black dot, which is the stinger.
- Reactions vary among those who get stung. They range from mild discomfort and swelling to an allergic reaction to bee venom, and some can die from a bee sting if they remain untreated for too long.

Local Reactions:

Local reactions may produce the following:

- The various components of the venom attack and act on different parts of the body.
- Pain occurs immediately after sting.
- Oedema is marked and may extend to 10 cm from site of envenomation.
- Bleeding may occur at site of sting.
- Pruritus is common.
- Vasodilatation may produce a sensation of warmth.
- Nausea or vomiting may occur without generalization.
- Distal sensation loss from stings over peripheral nerve.
- Corneal ulceration from corneal stings.

Generalized Reactions may Produce the Following Symptoms:

- Urticaria.
- Confluent red rash.
- Shortness of breath, wheezing.
- Odema in airway, tongue, or uvula.
- Weakness, syncope.
- Anxiety, confusion.
- Chest pain.

Mashaka-Fly

- Fly groups include crane flies, midges, gnats, mosquitoes, black flies, horse flies, window flies, robber flies, bee flies, houseflies, fruit flies, shore flies, dung flies, flesh flies and many others.
- Flies can land on food and transmit bacteria to humans. They are thought to carry disease by transporting infectious agents on their feet. They may spread polio, hepatitis A, Entamebahistalytica, typhoid, and other diseases.
- Biting flies attack humans to obtain a blood meal and can be very annoying. Some biting flies are also capable of transmitting disease.
- Biting flies of importance are sand flies, black flies, stable flies, horse flies and deer flies.
- The bite of these flies may be painful and swelling may occur later on and the area may remain red and itchy for several days or even longer.

Sand Flies:

- Sand flies are members of the insect order Diptera. Males do not bite. The adult females require blood to mature the eggs.
- Black flies are small, dark, stout-bodied flies with a humpbacked appearance. Some species that seldom bite can be very annoying because of their habit of flying around the head and face.
- The stable fly, also known as the dog fly or biting housefly, is a blood-sucking fly, which closely resembles the housefly. It is similar to the housefly in size and color, but may be recognized by its sharp, piercing mouthparts, which project forward from the head. Unlike many flies, both sexes of the stable fly are vicious biters.
- Horse flies and deer flies are closely related insects with similar life cycles. Both horse and deer flies are strong fliers and only the female bites. They are daytime feeders and can easily cut the skin open for a blood meal. While feeding an anticoagulant is injected into the wound and causes the blood to flow freely. Many people are allergic to horse fly and deer fly bites. Also, wounds are excellent sites for secondary infection. Since they are intermittent feeders, horse and deer flies are important transmitters of animal diseases.
- A horse-fly's bite can be very painful. Unlike insects that pierce the skin, horse-flies have mouthparts that work like miniature knives, which they use to slash open the skin with a scissor-like motion. This causes the blood to seep out as the horse-fly licks it up. While some horse-flies are known to have venom, none is known to be dangerous to humans. Horse-flies are most active in hot weather, mostly in summer and autumn during the daylight hours.
- Humans are not the mosquito's first choice for a blood meal. In fact, more than half of all mosquito species prefer to get their blood meal from birds, and large mammals and rodents are their second choice.
- The mosquito is a member of the family Culicidae; these insects have a pair of scaled wings, a pair of halteres, a slender body, and long legs. Size varies but is rarely greater than 15mm.
- Mosquitos are principally nectarfeeders with only the females requiring a meal of blood. Their bites can also transmit diseases, such as Malaria and West Nile Virus etc.
- The females require protein for egg development, and since the normal mosquito diet consists of nectar and fruit juice, which has no protein, most must drink blood to get the necessary protein.

- Mosquito bites often swell up hours after happening, causing a red ringed white bump about a centimeter in diameter.
- This bump can itch for days and over-scratching the bite can cause it to bleed. When a mosquito bites a human, she injects saliva and anti-coagulants.
- or any given individual, with the initial bite there is no reaction but with subsequent bites the body's immune system develops antibodies and a bite becomes inflamed and itchy within 24 hours.
- Some adults can become desensitized to mosquitoes and have little or no reaction to their bites, while others can become hyper-sensitive with bites causing large and painful red welts.



Sand fly



Black fly



Stable fly



Horse Fly



Deer Fly



Mosquito

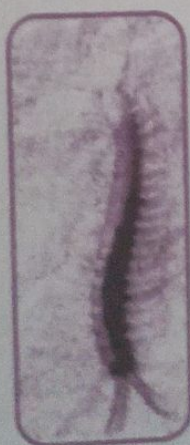
Shatapadi-Centipede

- Centipedes are fast-moving venomous, predatory terrestrial arthropods that have long bodies and many jointed legs.
- They are slender, multisegmented arthropods with one pair of legs per segment and one pair of antennae.

- Their size may range from 1 to 30 cm, and coloration from bright yellow to brown-black.
- The first pair of legs has been modified into two sharp stinging structures connected to muscular venom glands.
- Approximately 3000 species of centipedes are found in the class Chilopoda, phylum Arthropoda.
- They prefer dark damp environments, such as undersurfaces of rocks and logs, but on rainy days often retreat indoors.

There are 4 Orders:

1. Geophilomorpha (soil centipedes—small, innocuous soil dwellers)
 2. Scolopendramorpha (tropical or giant centipedes—known stingers)
 3. Scutigeramorpha (house centipedes—fast, but delicate)
 4. Lithobiomorpha (rock or garden centipedes—resemble small scolopendramorphs in appearance with many anecdotal reports of stings).
- **All orders are venomous.** The Scolopendra are the largest centipedes, and therefore probably the most dangerous.
 - Local symptoms include pain, erythema, edema, lymphangitis/lymphadenitis, weakness, and paresthesias. Skin necrosis may occur at the site of envenomation during the weeks following the sting, but rarely becomes extensive and heals spontaneously.
 - Systemic symptoms may include anxiety, fever, dizziness, palpitations, and nausea.
 - Excluding local skin necrosis, findings usually resolve within 2 days without sequelae. Extensive myonecrosis with subsequent compartment syndrome, rhabdomyolysis, and acute renal failure following sting from Arizona Scolopendra and Japanese Scolopendra species have been reported. They may even cause psychological disturbances and Korsakoff syndrome.



Pipeelika-Ants

- Ants are tiny insects and their size varies from 3mm to 3 cm. They are mostly drab colored - rusty, brown, black, and some can be yellow, green, purple or blue.
- Ants have a large head and a slender, oval abdomen joined to the thorax or midsection, by a small waist.
- The antennae are elbowed. They are important scavengers. Some species have a powerful sting at the tip of the abdomen.
- In addition to the poisonous fluid that ants are able to spray at a distance of up to 10 cm (containing formic acid, alkaloids etc.), they use their mandible for biting. Some species possess a very strong mandible – a deadly weapon against many enemies.
- Fire ants are stinging ants of the genus *Solenopsis*, of which there are 266 species.
- Fire ants are aggressive; they grab hold of your skin with their mandibles, and then curve their bodies under in a C-like shape and sting numerous times. Stings can produce sores or blisters, extreme pain and nausea.
- Blisters appear within 24 hours and should not be popped or broken open as they can become easily infected. Symptoms may be mild to severe and can be life threatening.
- Unlike many other ants, which bite and then spray formic acid on the wound, fire ants only bite to get a grip and then sting and inject a toxic alkaloid venom.
- For humans this is a painful sting- hence the name fire ant - and the after effects of the sting are deadly to some individuals.
- The venom of the fire ant bite causes stinging and swells into a bump. Some people are sensitive to the venom and experience anaphylaxis, which requires emergency treatment.
- Signs of anaphylaxis can include dizziness, nausea, sweating, low blood pressure, headache and shortness of breath.
- If the fire ants can be brushed off before they inject their venom, pustules will not form.
- Carpenter ants are large; generally black or dark brown in color, though some may have red or yellowish coloration such as the Florida carpenter ant (*Cabdominalis floridanus*).
- They have no stinger, although jaws are large and capable of inflicting a painful bite - especially since they may inject formic acid into the wound.



Fire ant



Carpenter ant.

Kanabha - Wasp

- Yellow jackets are honey bee size, about 1/2 to 3/4 inch long and black with bright yellow markings. They have a short, narrow attachment between the thorax and the abdomen, which is spindle shaped and tipped with a long stinger.
- As a yellow jacket stings, the reactions to stings vary depending on the number of stings delivered and body's reaction to the venom in the sting.
- Normal reactions are characterized by a painful, reddened swollen area that may also itch, but dissipates within minutes.
- More serious local reactions last for days. The pain, swelling and itching will be more intense in the area directly surrounding the sting site.
- The most serious reaction is a systemic anaphylaxis where a person may feel dizzy, nauseated and weak, experience stomach cramps and diarrhea.
- Also coughing, itching around the eyes, hives, wheezing, difficulty in breathing or swallowing, vomiting, low blood pressure, shock, unconsciousness, darkened skin and death can occur in highly sensitive people. This can all occur in 5 - 30 minutes.
- Hornets are often thought to be very aggressive and dangerous, and are much feared by some people.
- Hornets can actually be seen to slowly crawl backwards and eventually flee, rather than attacking, when approaching them. Hornets are not harmless, however.
- They have a painful sting and can cause anaphylactic shock to persons with an allergy to wasp venom, a condition which can be fatal.
- These reactions begin with noticeable swelling and redness in the affected area.
- Paper wasps attack when the nest is disturbed and each can sting repeatedly; stings

typically cause localized pain and swelling, but in sensitive individuals or when many stings occur whole body (systemic) effects can occur including allergic reactions that may result in death; males are incapable of stinging because the stinger on the females is a modified egg-laying structure (ovipositor) and it is not present in males.

Yellow jackets

Hornets

Paper wasp



कीट विष चिकित्सा:

- The doshas what so ever present, based on the symptoms should be assessed and treatment done for it, with drugs possessing opposite qualities.¹
- In case of affliction by vata aggravating poison, the patient should be treated by the application of khanda (paste of sugar/sesame) over the wound, massage with sesame oil, nadi and pulaka (a type dhanya) types of fomentation therapies and nourishing diet.²
- In case of affliction by pitta-aggravating poison, the patient should be treated with affusion which is very cold and which is stambhana (arresting the movement of fluids in the body) and the application of cold ointments.³
- Affliction by kapha aggravating poison should be treated with lekhana (which scrapes out the tissues), chedana (which causes incision in the tissue) fomentation and emetic therapies.⁴
- For the three kinds of insects (vata-pitta-kapha pradhana), three kinds of treatments are suitable- sudation (sweda), application of drugs (lepa) and bathing (seka) which should be done warm, except when the person has lost consciousness, when there is ulceration by bite or putrefaction at the bite site.⁵

१. यस्य यस्य हि दोषस्य लिङ्गाधिक्यानि लक्षयेत्।

तस्य तस्य औषधः कुर्यात् विररीत गुणैः क्रियाम्॥ (च.चि. २३/१६६)

२. खण्डेन च व्रणालेप स्तौलाभ्यङ्गस्य वातिके। स्वेदो नाडी पुलाकाद्यैर्बृंहणश्च विधिर्हितः॥

३. सुशीतैः स्तम्भयेत् सेकैः प्रदेहैश्चापि पैत्तिकम्।

४. लेखन छेदन स्वेदन वमनैः श्लैष्मिकं जयेत् ॥ (च.चि. २३/१७०-१७१)

५. कीटानां त्रिप्रकाराणां त्रैविध्येन क्रिया हिता। स्वेदालेपन सेकांस्तु कोष्णान् प्रायोऽवचारयेत्॥

अन्यत्र-----

- Severe form of insect poisoning should be treated as that of snake bite poisoning.¹
- Equal quantities of tanduliya and trivrt should be consumed mixed with ghee, such a person does not get shaken by the poison of insects just as the mountain kailasa by the wind.²
- Application of paste of bark of tree of milky sap after the person has undergone purifactory therapies destroys the poison of insects.
- Application of paste of mukta (pearls) is best to cure swelling, pricking pain, burning and fever.³

Dashanga Agada:

वचा हिङ्गु विडंगानि सैधव गजपिप्पली पाठा प्रतिविषा व्योषं काश्यपेन विनिर्मितम् दशांगं अगदं पीत्वा सर्व कीट-विषं जयेत्। (अ.ह.उ. ३७/२७)

The drugs vacha, hingu, vidanga, saindhava, gajapippali, patha, prativisha and vyosha are made into nice paste and rolled into pills- this dashanga agada formulated by kashyapa cures the poison of all kinds of insects.

लूता विष

Origin- Mythological Origin of Loota:

1. Drops of sweat on the forehead of sage vasistha, who was angered by King Vishwamitra, which fell on the cut grass transformed themselves into Loota (spiders).⁴
2. During the burning of Khandava forest, the sparks of fire which came from the body of asuras/demons became loota.⁵
3. One more opinion states that intake of दुष्ट अन्न or contaminated food might lead to formation of visha sphota or vescicles and these are known as Loota.⁶

Classification of लूता:

1. Based on दोष प्रकोप*

- a. वायव्य- causes वातरोगा and are उद्भिदा- 7 in number.

१. साधयेत् सर्पवद्वहान् विषोद्यैः कीट वृक्षिकैः। (अ.ह.उ. ३७/२४)
२. तण्डुलीयक तुल्यांशं त्रिवृतां सर्पिषा पिबेत्।
याति कीट विषैः कंपम् न कैलास इवानिलैः॥ (अ.ह.उ. ३७/२५)
३. सौरिकृष त्वगालेषः शुद्धे कीट विषापः। मुक्तालपो वरः शोफ तोद दाह ज्वर प्रणुत्॥ (अ.ह.उ. ३७/२६)
४. विषामित्राव रुष्टस्य वसिष्ठस्य ललाटजाः। स्वेदलेशाः स्मृता लूता लूने ये पतितास्तृणे॥ (अ.सं.उ. ४४/२)
५. खाण्डवे दहयमानानामसुराणां शरीरतः। ये स्फुलिङ्गा विनिश्चेरुस्ते लूता इति केचन॥ (अ.सं.उ. ४४/३)
६. अन्ये वदन्ति भुक्तस्य दुष्टस्यान्नस्य मूर्च्छनात्। सम्भवन्ति विषस्फोटा ये लूता॥ (अ.सं.उ. ४४/३)
७. आग्नेयः स्वेदजाः सप्त लूताः पित्तविकारदाः।
अपहजाः सप्त श्लेष्मविकारदाः।
सप्त वायव्या वायुरोगदाः।
मित्रा सप्तोपपादिकाः। व्याप्नुवन्त्याशु गात्राणि ज्वलात् पावक सन्निभाः।
सन्निपातकृतोऽसाध्याः कुच्छेद्यचेतराः॥ (अ.सं.उ. ४४/६-१०)
मित्रा सप्तोपपादिकाः। व्याप्नुवन्त्याशु गात्राणि ज्वलात् पावक सन्निभाः।

- b. आग्नेय- causes पित्तज रोगा originated by स्वेद are 7 in number.
- c. सौम्य- cause कफजन्य विकारा originated by अण्डज 7 in number.
- d. मिश्र- Its विष spreads very quickly also called as उपपादिका

2. Based on the विष प्रभाव- लूता are 3 types¹

- a. तीक्ष्ण विषयुक्त- Death will occur in 7 days following bite.
- b. मध्यम विषयुक्त- Death will occur in 7-10 days following bite.
- c. मन्द विषयुक्त- Death will occur in 15 days following bite.

3. Based on साध्यासाध्यता²:

- a. कृच्छ्रसाध्या- difficult to cure, they are 8 in number.
- b. असाध्या- incurable, 8 in number.

लूता विष अधिष्ठानः

श्वास दंष्ट्रा शकृन्मूत्र शुक्र लाला नख आर्तवैः । अष्टाभिरूदमन्थेता विषं वक्त्राद्विशेषतः ।। (अ.स.उ. ४४/१५)

Loota emits poison from their-

१. श्वास	-	breath	५. शुक्र	-	semen
२. दंष्ट्रा	-	teeth	६. लाला	-	saliva
३. शकृत्	-	excreta	७. नख	-	nail
४. मूत्र	-	urine	८. आर्तव	-	menstrual blood.

१. सामान्य लक्षणः

“दंशाः सामान्यतस्तासां दद्रुमण्डलसन्निभः । सितोऽसितोरुणः पीतः श्यावो वा मृदुरुन्नतः ।।

“मध्ये कृष्णोऽथवा श्यावः पर्यन्ते जालकावृतः । विसर्पवाज्छोफयुतस्तप्यते बहुवेदनः ।।

“ज्वराशुपाकविकलेद कोथावदरणान्वितः । क्लेदेना यत्स्पृशत्यङ्गं तत्रापि कुरुते व्रणम् ।। (अ.स.उ. ४४/१२)

General symptoms of the bite of लूता

दद्रुमण्डल	-	appearance of a round rash.
सित	-	white
अरुण	-	mild red
पीत	-	yellow
श्याव	-	blue in colour.
मृदु उन्नत	-	soft and raised up
मध्ये कृष्ण अथवा	-	the centre is either black or blue and
श्याव पर्यन्त जालकावृतः	-	resembling a net at its edges.
विसर्पवान् शोफयुतस्तप्यते-		Burning sensation and swelling spreads sideways.

१. तीक्ष्ण मध्य अवरत्वेन घ्नन्ति वाऽऽशु अचिकित्सिताः ।

सप्ताहेन दशाहेन पक्षेण च परं क्रमात् ।। (अ.सं.उ. ४४/५)

२. कृच्छ्रसाध्य तथा असाध्या लूतास्तु द्विविधाः स्मृता ।

तस्मादहो कृच्छ्रसाध्या वर्ज्यास्तावत्य एव तु ।। (सु.क.८/१४)

बहुवेदन	-	severe pain
ज्वर	-	fever
पाक	-	under goes quick ripening/ulceration
विकलेद	-	exudation
कोथ	-	purification and loss of tissues
क्लेदेन यत् स्पृशत्यङ्गं	-	when the pus from the wound comes in
तत्रापि कुरुते व्रणम्	-	contact with other parts, then the new ulcers are formed on those parts.

2. विष लक्षण According to Vitiation of दोष's:

Generally, the poison of the loota have properties of all tridosas and they give rise to following diseases.

पित्त'	श्लेष्म	वात
दाह- burning	कठिन शोफ- hard	परूष शोफ- swelling
sensation	swelling	is rough
तृट- thirst	पाण्डु - swelling	श्याव - and it is
स्पोट - formation	will be white	(swelling) blue
of vesciles	in colour	in colour
ज्वर - fever	कण्डु - itching	पर्वभेदादिरूक्कर
	रूक् - mild pain	pain in the joints

3. विष लक्षण According to Stage Wise/Day Wise²:

दिनार्ध लक्ष्यते नैवं दंशो लूताविषोद्भवः- The lesion at the site of the bite by loota does not manifest for half a day. (from the time of bite).

1st Day:

1. सूचीव्यधवदाभाति- It appears as though pricked by a needle.
2. अव्यक्त वर्ण- without any change in colour in affected part.
3. रूक् and कण्डु- there will be slight pain and itching.

१. दंशः पित्तात्मको दाह तृट्स्फोट ज्वर दाहवान् । सशोफः कठिनः पाण्डुः कण्डूमान् श्लेष्मिकोल्परूक् ॥

वातिकः परूषः श्यावः पर्वभेदादिरूक्करः ॥ (अ.सं.उ. ४४/१७)

२. दिनार्ध लक्ष्यते नैवं दंशो लूताविषोद्भवः । सूचीव्यधवदाभाति ततोऽसौ प्रथमेऽहनि ॥

अव्यक्तवर्णः प्रचलः किञ्चित्कण्डूरुजान्वितः । द्वितीयेऽभ्युन्नतोऽन्तेषु पिटिकैरिव वाऽऽचितः ॥

व्यक्तवर्णो नतो मध्ये कण्डूमान् ग्रन्थिसन्निभः । तृतीये सज्वरो रोमहर्षकृद्रक्तमण्डलः ॥

शरावरूपस्तोदाढ्यो रोमकूपेषु सास्त्रवः । महोश्चतुर्थे श्वयथुस्तापश्चासभ्रमप्रदः ॥

विस्मयान् कुरुते तांस्तान् पञ्चमे विषकोपजान् । षष्ठे व्याप्राप्ति मर्माणि सप्तमे हन्ति जीवितम् ॥

2nd Day:

1. उन्नत- edges are raised
2. पिटक- surrounded by eruptions
3. व्यक्त वर्ण- change in the colour of skin
4. नतो मध्ये- depressed in the centre
5. कण्डु- has itching
6. ग्रन्थि- resembles a tumour

3rd Day:

1. ज्वर- fever
2. रोमहर्ष- horripilation
3. शरावरूपस्तोद- red circular patches with shape of soucer associated with pain.
4. रोमकूपेषु सास्त्रवः bleeding from the hair follicle.

4th Day

1. श्वयथु- there is profound swelling
2. ताप- temperature is raised
3. श्वास- dyspnoea
4. भ्रम- giddiness

On 5th Day

1. It give rise to symptoms of poisoning related to the dosa.

On 6th Day

1. व्याप्नोति मर्म- The poison invades all the vital organs.

On 7th Day

1. हन्ति जीवितम्- The poison invades all the vital organs

4. Signs and Symptoms According to the Site of Poison:**1) By Breath- श्वास¹**

शूयते	-	swelling
ज्वर	-	fever
दाह	-	burning sensation

2) By Teeth- दंष्ट्र²

उग्रतरो विवर्ण	-	discolouration
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१. श्वासेन दंशः सहसा शूयते ज्वरदाहवान्।

२. दंष्ट्राकृतस्तूयतरो विवर्णः कठिनः स्थिरः। गम्भीर शोफवस्तोद वेदना दाह संयुतः॥

कठिन	- area is hard
स्थिर	- firm
गम्भीर शोफ	- profound swelling
स्तोद	- pricking pain
वेदना	- pain

3) Excreta - शकृत्^१

दुर्गन्धी	- foul smelling
दाह	- burning sensation
कण्डू	- itching
चिमिचिमान्वित	- feeling of pins and needles
पच्यते चाशु	- ripens quickly
पक्वश्च पाण्डुः	- when ripe, it is yellowish white
पीलुफलोपमः	- resembles the fruit of pilu

4) By Urine- मूत्र^२

रक्तपर्यन्तो मध्ये कृष्णो विशीर्यते	- swelling has red coloured and black centre
आवर्तसदृशः	- resembles a whirl
शूनः पूति	- emits foul smell
सर्पति	- spreads outwards
दध्यते	- has burning sensation

5) By Semen- शुक्र^३

ग्रंथि संस्थान	- swelling resembles a tumour
कठिन	- Is hard
तीव्र वेदनः	- very painful

6) By Saliva- लालास्राव^४

अल्पमूलो	- elevated rash which is not deep seated
अल्परुक्कोठो	- little pain
कण्डुरो	- itching
मृदु	- soft to touch

१. दुर्गन्धी शकृता दाह कण्डू चिमिचिमान्वितः ।
पच्यते चाशु पक्वश्च पाण्डुः पीलुफलोपमः ॥ (अ.सं.उ. ४४/१६-१७)
२. मूत्रेण रक्तपर्यन्तो मध्ये कृष्णो विशीर्यते। आवर्तसदृशः शूनः पूतिः सर्पति दध्यते ॥
३. शुक्रेण ग्रन्थिसंस्थानः कठिन स्तीव्र वेदनः।
४. अल्प मूलोत्परुक्कोष्ठो लालया कण्डुरो मृदुः ॥ (अ.सं.उ. ४४/१८-१९)

7) By Nails- नखेन^१

चोष	- burning sensation
पिटका	- eruptions
कण्डू	- itching
धूमायनान्वितः	- feeling as though hot smoke is coming out.

8) By Menstrual Blood- रजसा^२

किंशुकोदर वर्णस्तः	- eruptions appear having colour of kimsuka flowers. (red)
चञ्चुमालवान्	- resemble a garland

असाद्य लक्षणः^३

The bites which are going to be fatal, will display the following symptoms.

हृन्मोह - pain in the heart

श्वास - dyspnoea

हिध्म - hiccup

शिरोग्रह - pain in the head

श्वेत, पिटक, सिता, पीत, रक्त पिटक - the eruptions which will be either white, black, yellow or red.

श्वयथूद्भवः - swelling.

वेपथु - rigors.

दाह - burning sensation.

तृट् - thirst

अन्ध्य - blindness

श्याव ओष्ठ, श्याववक्त्र, श्याव दन्त- the lips, mouth and teeth are blue

वक्रनास - distortion of nose

पृष्ठग्रीवावभञ्जन - bending of back and neck.

स्रवति शोणितम् पक्व जम्बूसवर्ण - the blood of the colour of ripe जम्बु फल flows out from the site of bite.

१. नखेन चोष पिटका कण्डू धूमायनान्वितः।

२. किंशुकोदर वर्णस्तु रजसा चञ्चुमालवान्॥ (अ.सं.उ. ४४/२०)

३. प्राणान्तिकोषु हृन्मोह श्वास हिध्मा शिरोग्रहाः। श्वेतासिताः पीतरक्ताः पिटकाः श्वयथूद्भवः ॥

वेपथुर्वमथुर्दाह स्तृडान्ध्यं वक्रनासता। श्यावोष्ठ वक्त्र दन्तत्वं पृष्ठग्रीवाव भञ्जनम् ॥

पक्व जम्बूसवर्णं च दंशात् स्रवति शोणितम् ॥ (अ.सं.उ. ४४/३४)

लूतादंश चिकित्सा:

नस्य अञ्जन अभ्यञ्जन पान धूमं तथाऽवपीडं कवलग्रहं च।

संशोधनं चोभयतः प्रगाढं कुर्यात्सिरामोक्षणमेव चान्त।।" (सु.क.८/१३४)

The treatment for लूता दंश are as follows,

1. नस्य - nasal medication
2. अञ्जन - collyrium
3. अभ्यञ्जन - oil massage
4. पान - internal administration of medicaments.
5. धूम - inhalation of medicated smoke
6. अवपीडन - nasya
7. गण्डूष - gargling
8. वमन - emesis
9. विरेचन - purgation
10. सिरामोक्षण - blood letting

Apart from this, the treatment include the following

1. उद्धरण - शस्त्रेणादंशमुद्धरेत्- The teeth of the spider should be removed with the help of शस्त्र (knife) immediately¹.
2. दहन - The place burnt by heated stone, (the bite site which is very rough, having damaged hairs, located on vital parts bony joints should neither be cut or burnt².
3. लेप - After दहन the place must be applied with a paste of antipoisonous recipe added with honey and saindhava lavana.³
4. सेक - The part is bathed often with decoction of barks of ksheerivriksha.⁴
5. रक्तमोक्षण - blood should be let out by the शृंग (sucking horn) or by सिरा (cutting the veins)⁵.
6. परिशेक - Then bathing the part with the decoction of बोधि, श्लेष्मातक, अक्षक वृक्ष, and applying their paste in cold condition.⁶
7. वमन - Kapha should be removed by वमन कर्म⁷

१. अथाशु लूतादष्टस्य शस्त्रेणादंशमुद्धरेत्।
 २. दहेत जांबवोष्ठाद्यैर्न पित्तोत्तरं दहेत् ॥ (अ.सं.उ. ४४/३५)
 ३. लेपयेद्गन्धमगदैर्मधुसैन्धव संयुतैः। (अ.सं.उ. ४४/३७)
 ४. सुशीतैः सेचयेच्चानु कषायैः क्षीरिवृक्षजैः ॥ (अ.सं.उ. ४४/३७)
 ५. सर्वतोः अपहरेद्रक्तं श्रङ्गाद्यैः सिरयापि वा।
 ६. स्नुते रक्ते परिषेको घृत क्षीरादिभिर्हितः ॥ (अ.सं.उ. ४४/३८)
 ७. उदीर्णं दोषान् बलिनो विषे महति वामयेत् ॥ (अ.सं.उ. ४४/५१)

8. विरेचन - purgation should be done by using त्रिफला, नीलिनी etc.¹
9. बस्ति - when the person is suffering from flatulence, hiccup etc of vata origin, basti chikitsa is administered.²
10. नावन नस्य - when there is feeling of heaviness of head, swelling etc, navana nasya is administered.³
11. अञ्जन - If disorders of vision, swelling and itching in the eyes are present, anjana is administered.⁴
12. कर्णिका पाथन - Removal of sting⁵

After burning sensation (दाह), swelling subside (निवृत्तशोफ) the कर्णिक- (ring like muscular growth in the wound) or sting should be made to fall off from the wound.

- Flower of कुसुम्भ, गोदन्त cow's tooth or gypsium, कपोतविट्- excreta of pigeon त्रिवृत्, सैन्धव are made into paste and are applied for removal of sting.⁶
- At the time of removal of the muscular ring/sting the person should be given nourishing food which are antipoisonous.⁷

१३. सर्पि प्रयोग-

During the treatment of spider bite poisoning, only ghee should be used for all lubrication therapies, since oil increases the poison greatly like a bundle of hay put on a fire.⁸

Spiders

- There are at least 50,000 spider species in the arachnid family.
- Spiders are defined as having eight jointed legs, no wings, no antennae and only two body sections: the thorax and the abdomen.
- All spiders have some amount of venom with varying degrees of potency.
- The venom is injected through the hollow fangs into the victim.
- The venom will rapidly paralyze the victim and aid in digestion.
- Fortunately, most spiders are not dangerous to humans because their fangs are either too short or too fragile to penetrate human skin.

१. विरेचयेच्च त्रिफला त्रिवृत् त्रिकटु सैन्धवैः.....। (अ.सं.उ. ४४/५३)
२. आध्मान हिष्मा श्वासेषु.....बस्तौ.....॥ (अ.सं.उ. ४४/५७-६१)
३. नावनं गौरवे शोफे लालास्रावे हनुग्रहे.....नस्यं विषहरं परमा॥ (अ.सं.उ. ४४/६४)
४. नेत्रोपरोधं श्वयथु कण्डू निद्रा समागमे।.....स्रोतोञ्जन रसाञ्जने॥ (अ.सं.उ. ४४/६६-६८)
५. निवृत्ते दाहशोफादौ कर्णिका पातयेद् व्रणात्॥ (अ.सं.उ. ४४/८०)
६. कुसुम्भ पुष्पं गोदन्तः स्वर्णक्षीरी कपोतविट् । त्रिवृता सैन्धवं दन्ती कर्णिका पातनं तथा ॥
७. कर्णिका पातसमये बृंहयेत् विषापहैः। (अ.सं.उ. ४४/८३)
८. स्नेहकार्यमशेषं च सर्पिषैव समाचरेत् । विषस्य वृद्धये तैलमग्रेरिव तृणोलपम्॥ (अ.सं.उ. ४४/९१)

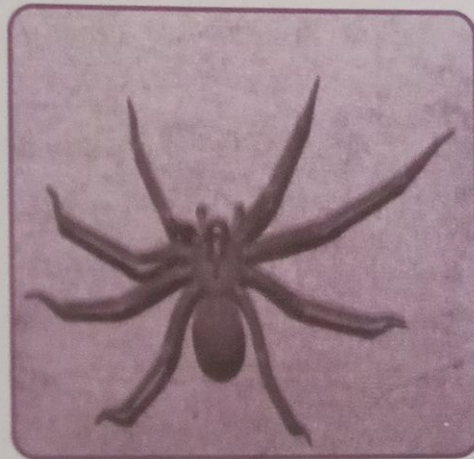
The most venomous varieties of spiders include the following:

BROWN RECLUSE SPIDER:

- The brown recluse spider is also known as the violin spider or fiddleback spider.
- It is a venomous spider, *Loxosceles reclusa*, of the family Sicariidae.
- It is usually between 1/4 and 3/4 inch but may grow larger.
- It is brown and usually has markings on the dorsal side of its thorax, with a black line coming from it that looks like a violin with the neck of the violin pointing to the rear of the spider resulting in the nickname "fiddleback spider" or "violin spider".
- Coloring varies from light tan to brown and the violin marking may not be visible.
- Two other features can help identify the brown recluse: it has six eyes rather than the typical eight and the tail-end segment has no markings.

Scientific Classification

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Araneae
Family	Sicariidae
Genus	<i>Loxosceles</i>
Species	<i>L. reclusa</i>



Binomial Name

Loxosceles reclusa

- It usually bites only when pressed against human skin, such as when putting on an article of clothing.

Symptoms of a Brown Recluse Spider Bite:

- The bite produces a mild stinging, followed by local redness and intense pain within eight hours.
- The wound takes on a bull's-eye appearance, with a center blister surrounded by an angry-looking red ring and then a blanched or white ring.
- The fluid-filled blister then sloughs off to leave a deep, enlarging ulcer.
- The ulcer can enlarge and involve underlying skin and muscle tissue.
- Pain may be severe.
- A generalized red, itchy rash usually appears in the first 24-48 hours.
- Other symptoms include fever, chills, nausea, vomiting, muscle aches and hemolytic anemia.

- On rare occasions death results, more often in children.

BLACK WIDOW SPIDER:

Scientific Classification

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Araneae
Family	Theridiidae
Genus	Latrodectus



Binomial Name

Latrodectus mactans

- The widow spiders are members of the spider genus *Latrodectus*, in the family Theridiidae.
- *Latrodectus* includes approximately 31 recognized venomous species, with the black widow spider being the best known member of the group.
- Widow Spiders carry a neurotoxic venom.
- The black widow spider is a shiny, inky black spider with a large round tail segment (abdomen), generally measuring from one-half inch to one inch in length.
- Widow spiders are large, strong-looking house spiders.
- The abdomen is dark and shiny, and has one or several red spots, either above or below.
- The spots may take the form of an hourglass, or two triangles, point-to-point.
- Male widows, like most spiders, are much smaller than the females and are generally considered to be much less dangerous than the females.
- Widows tend to be quite non-aggressive, but will bite if the web is disturbed and the spider feels threatened.

Symptoms of a Bite:

- The bite feels like a pinprick.
- A black widow spider bite gives the appearance of a target, with a pale area surrounded by a red ring.
- At first you may notice only slight swelling and faint red marks.
- Within a few hours, intense pain and stiffness begin.
- Other signs and symptoms include-chills, fever, nausea, severe abdominal pain etc.

- Severe muscle pain and cramps may develop in the first two hours.
- Severe cramps are usually first felt in the back, shoulders, abdomen and thighs.
- Other symptoms include weakness, sweating, headache, anxiety, itching, nausea, vomiting, difficult breathing and increased blood pressure.

WOLF SPIDERS:

- Wolf spiders are large hairy spiders, up to 3-4 inches across.
- They are a mottled gray-brown color.
- They are aggressive, come after their prey and are fast runners.
- Bites from a wolf spider can cause pain, redness and swelling.
- The large jaws/fangs can cause a tear in the skin as they bite.
- Swollen lymph glands may develop.
- The skin area at the bite may turn black.
- Swelling and pain can last up to ten days.



TARANTULAS:

- Tarantulas are also large hairy spiders with sharp bristles.
- The hairs are easily shed or can be rubbed off.
- Handling a tarantula can result in irritation to the skin.
- If hands are not washed after handling a tarantula and eyes are touched the sharp hairs can cause eye irritation.
- Their bites can be quite painful because of the large size of the spider.



वृश्चिक विष

Vrischika (scorpion) are grouped as Keeta varga in Ayurvedic classics. There are about 30 varieties of Vrischika according to Ayurveda.

Classification:

Based on the poison they contain, Vrischika are of 3 types¹

1. मन्दविष वृश्चिक- mild poison
2. मध्यमविष वृश्चिक- moderate poison

१. त्रिविधा वृश्चिकाः प्रोक्ता मन्द मध्य महाविषाः। (सु. क. ८/५६)

3. तीक्ष्ण विष वृश्चिक- virulent poison

मन्दविष वृश्चिक¹

- These type of vrischika are found in the following colour.
- श्याव (Blue); कृष्ण (black); कर्बुर (variegated); पाण्डु/सिता (pale/white); मेचक (dark blue); पीत (yellow); लोहित (red); colour of cow's urine (गोमूत्राभः) smoke colour (धूम्र).
- These scorpion may be hairy and rough.
- They have reddish or whitish abdomen.
- Possess many joints in the tail.

मध्यम विष वृश्चिक²

- These वृश्चिका's may be found in following colours- Red, yellow, brown.
- They have smoke coloured abdomen.
- They have 3 joint in their tail.

महा विष वृश्चिक³

- These are seen in the following colours
- श्वेत (white); चित्र (multicoloured); श्यामल (bluish); लोहित (blood coloured); रक्तनील (reddish blue); reddish brown.
- They have reddish blue (or) reddish abdomen.
- They may possess 1-2 joints and sometimes no joints in their tail.
- Have different shapes and colours and are terrifying.

Origin⁴

- मन्दविष वृश्चिका's originate from go-shakrit kotha ie. putrified cowdung.
- मध्यमविष वृश्चिका's originate from decayed kashta ishtika- wood or bricks.
- महाविष वृश्चिका's originate from sarpakotha i.e. putrified dead bodies of snakes.

Number⁵

मन्दविष वृश्चिका	-	12
मध्यमविष वृश्चिका	-	03
महाविष वृश्चिका	-	15
Total -		30

1. कृष्णः श्यावः कर्बुरः पाण्डुवर्णो गोमूत्राभः कर्कशो मेचकश्च पीतो धूम्रो रोमशः शाङ्खलाभो रक्तः श्वेतो नोदरेणेति मन्दाः॥ (सु. क. ८/५९)
2. रक्त पीतः कपिलेनोदरेण सर्वे धूम्राः पर्वभिश्च त्रिभिः स्युः एते मूत्रोच्चारपूत्यण्डजाता मध्या ज्ञेयास्त्रिप्तकारोरगाणाम् ॥ (सु. क. ८/६१)
3. श्वेतश्चित्रः श्यामलो लोहिताभो रक्तः श्वेतो रक्तनीलोदरौ च। पीतोऽरक्तो नीलपीतोऽरस्तु रक्तो नीलो नीलशुक्लस्तथा च॥ रक्तो वध्रुः पूर्ववच्चैकपर्वा यश्चापर्वा पर्वणी द्वे च यस्या नानारुपा वर्णतश्चापि घोरा ज्ञेयाश्चैते वृश्चिकाः प्राणचौराः। (सु. क. ८/६३-६४)
4. गोशकृत्कोथजा मन्दा मध्याः काष्ठेष्टिकोद्भवा। सर्पकोथोद्भवास्तीक्ष्णा ये चान्ये विषसम्भवनाः॥ (सु. क. ८/५६)
5. मन्दा द्वादश मध्यास्तु त्रयः पञ्चदशोत्तमाः। दश विंशतिरित्येते संख्यया परिकीर्तिताः॥ (सु. क. ८/५८)

साध्य वृश्चिका^१

The person is said to have bitten by साध्यवृश्चिक if the following signs and symptoms develop in the person.

- स्तम्भं शोफसो - loss of movement of penis.
- दृष्टरोमताम् - horripilation.
- शीताम्बुसेकमङ्गानां एव- feeling as though cold water is sprinkled all over the body.
- As these वृश्चिका's travel during night, they are known as रात्रिका.
- They are also known as उष्ट्रधूमक, as they have the colour similar to that of camel.

Vrischika Damsha Lakshana- General Signs and Symptoms of Vrischika Damsha:

वृश्चिकस्य विषं तीक्ष्णमादौ दहति वह्निवत् । ऊर्ध्वमारोहति क्षिप्रं दंशे पश्चात्तु तिष्ठति ।।

दंशः सद्योऽतिरुक् श्यावस्तुद्यते स्फुटतीव च । (अ.ह. ३७/६)

The characteristic of scorpion poison are:

तीक्ष्ण - highly penetrating

आदौ दहति वह्निवत् - produces burning sensation just like the fire at the beginning itself.

ऊर्ध्वं आरोहति क्षिप्रं - quickly rises upwards.

पश्चात् दंशे तिष्ठति - later settles in the site of bite.

दंशः सद्योतिरुक् - the site is highly painful.

श्याव - bluish discolouration of the site.

तुद्यते स्फुटतीव - has pricking and bursting sensation.

वृश्चिक दंश लक्षण According to its Classification:

a) महाविष वृश्चिक^२:

The sign and symptoms are as follows:

- शूनरसनः - swelling of the tongue
- स्तब्ध गात्र - rigidity of body parts
- रुजा - pain
- कृष्णशोणित वमन - vomits the blood which is black.
- इन्द्रियार्थानसंविदन् - does not recognise the sensory perceptions.
- स्विद्यन् - perspires
- मूर्च्छन् - faints

१. साध्यतो वृश्चिकात् स्तम्भं शोफसो दृष्टरोमताम्। करोति सेकमङ्गानां दंशः शीताम्बुनेव च।।

उष्ट्रवर्णतथा प्रोक्तः स एव ह्युष्ट्रधूमकः ।। रात्रिको रात्रिचाराच्च।। (अ.सं. ४३/३७)

२. तैदृष्टः शूनरसनः स्तब्धगात्रो रुजादितः। खैर्वमन् शोणितं कृष्णमिन्द्रियार्थानसंविदन्।।

स्विद्यन् मूर्च्छन् विशुष्कास्यो विह्वलो वेदनातुरः। विशीर्यमाण मांसश्च प्रायशो विजहात्यसून् ।। (अ.सं.उ. ४३/३४-३५)

- शुष्कास्य - mouth becomes dry
 - विशीर्यमाण मांस - muscles at the site of bite drop off
 - सर्प वेग प्रवृत्ति¹ - impulses of snake poison emerges
 - ज्वर - fever
 - स्फोटोत्पत्ति - eruptive boils emerge
- Generally, the person dies after bitten by महाविष वृश्चिक

b) मध्यम विष वृश्चिकः

- The following symptoms may be recorded.²
- a) जिह्वा शोफ - inflammation/swelling of tongue
- b) भोजनस्य अवरोध - obstruction of food
- c) मूर्च्छा - severe fainting

c) मन्दविष वृश्चिक³:

The following symptoms may be recorded.

- वेदना - pain
- वेपथु - trembling
- गात्रस्तम्भ - stiffness in body
- कृष्णरक्तागम - outflow of black blood
- दाह, स्वेद - burning sensation, sweating
- शोफ - local inflammatory swelling
- ज्वर - fever.

If stung in extrimities, pain rushes upwards.

Treatment:

१. मन्त्र विधि : (योगरत्नाकर):

Mantra chikitsa has been explained for Vrischika damsha. This procedure might have been used for assurance of the patient. Anyhow it is no more relevant in the present era.

२. सेकः

सद्यो वृश्चिकजं दंशं चक्रतैलेन सेचयेत्। विदारिगन्धासिद्धेन कवोष्णेनेतरेण वा ।।

लवणोत्तमयुक्तेन सर्पिषा वा पुनः पुनः। सिञ्चेत्कोष्णारनालेन सक्षीरलवणेन वा ।।(अ.सं.उ. ४३/६५)

The site of scorpion sting should be immediately bathed with any of the following:

- चक्रतैल
- तैल prepared by विधारीगन्ध
- Any other oil made luke warm

१. एभिर्दष्टे सर्पवेगप्रवृत्तिः स्फोटोत्पत्तिर्भ्रन्ति दाहौ ज्वरश्च ।

खेभ्यः कृष्णं शोणितं याति तीव्रं तस्मात् प्राणैस्त्यज्यते शीघ्रमेवा ।। (सु.सं.क. ८/६६)

२. जिह्वाशोफो भोजनस्यावरोधो मूर्च्छा चोग्रा मध्य वीर्याभिदष्टे ।। (सु.सं.क. ८/६२)

३. एभिर्दष्टे वेदना वेपथुश्च गात्रस्तम्भः कृष्णरक्तागमश्च ।

शाखादष्टे वेदना चोर्ध्वमेति दाहस्वेदौ दशशोफो ज्वरश्च ।। (सु.सं.क. ८/६०)

- Ghee mixed with लवणोत्तम/सैन्धव लवण
- Milk added with सैन्धव लवण
- Fermented luke warm rice-wash

३. उपनाहः

उपनाहो घृते भृष्टः कल्कोजाज्याः ससैन्धवः ॥ (अ.सं.उ. ४३/६६)

The paste of अजाजी fried in ghee and added with सैन्धव should be applied as warm poultice.

४. लेपनम्:

i) जीरकादि लेपः

Application of the warm paste of जीरक mixed with ghee, honey and सैन्धव removes scorpion poison and pain.

ii) अजक्षीरादि योगः

लेप prepared from the equal parts of शिरीषफल and पिप्पली by processing in अजक्षीर should be applied over the affected spot.

iii) कार्पास पत्रादि योगः

कार्पास पत्र should be rubbed into a paste with addition of ghee and applied over scorpion bite.

iv) Seeds of जयपाल are ground to fine paste by adding water and are coated over the wound.

v) उल्लीपाषाण लेप

उल्लीपाषाण (arsenic poison) and निम्बूस्वरस are pounded to fine paste and applied over bite site.

vi) Seeds of पालाश are ground into a paste with milky sap of अर्क and is applied on the site of bite.

vii) Pill prepared with हिङ्गु, हरिताल and juice of मातुलुङ्ग can be used in the form of external application.

viii) If the poison has greatly increased, then the site has to be smeared with स्थावरविष paste whichever is appropriate.

५. अगद पानः

- Portions of ghee, milk, honey added with profuse quantity of sugar are given to the patient to drink.
- The uncrystallised syrup prepared by processing चातुर्जातिक and sugar either in cold water or cold milk is given to drink.

दशांग अगदः

वचा, हिङ्गु, विडङ्ग, सैन्धव, गजपिप्पली, पाठा, प्रतिविषा व्योषा- all the above taken in equal quantity should be made into kalka by adding water and given internally.

मनः शिलादि गुटिकाः

शुद्ध मनःशिला, कुष्ठ, करञ्जबीज, शिपिरबीज and गम्भारीबीज are all taken in equal quantity and mixed and made into pills. This pill is administered internally and applied as lepa over the bite spot.

बिल्वादि गुटिकाः

बिल्वस्य मूलं सुरसस्य पुष्पं फलं करञ्जस्य नतं सुराह्वम् ।

फलत्रिकं व्योष निशाद्वयं च बस्तस्य मूत्रेण सुसूक्ष्मपिष्टम् ॥

भुजङ्गलूतोन्दुरवृश्चिकाध्यैर्विसूचिकाजीर्णं गर ज्वरैश्च ।

आर्तान्नरान् भूतविधर्षिताश्च स्वस्थीकरोति अञ्जन पान नस्यैः ॥ (अ.ह.उ. ३६/८४)

The roots of bilwa, flowers of tulasi, fruits of karanja, tagara, devadaru, triphala, trikatu and haridra and daruharidra are triturated with urine of goat untill they become very fine and then rolled into pills. This tablet known as bilwadi gutika is used for anjana, pana and nasya in cases of snake, spider, seorpion and other bites and also in cases of ageerna, visuchika, gara and jwara.

Treatment for मध्यम an महाविष वृश्चिक Bites¹:

- The person stung by मध्यम and महाविष वृश्चिक should be treated as if bitten by snake.
- The site of the bite must be fomented.
- The site must be scarified.
- Powders of हरिद्रा, सैन्धव, त्रिकटु and flowers and fruits of शिपिष are rubbed to the site.
- Paste of tender leaves of तुलसी with मातुलुङ्ग juice and cow's urine is used.
- The site has to be fomented with warm cowdung.
- Ghee mixed with honey or milk added with plenty of sugar is beneficial.

Treatment for मन्दविष वृश्चिक Bite²:

- The site of scorpion bite is irrigated with चक्रतैल or warm oil cooked with विदार्यादि drugs.
- The site must be fomented with उत्कारिक
- Poultice should be applied with antipoisonous drugs.
- The patient should be given to drink well cooked jaggery water mixed with चातुर्जात.

	मन्दविष वृश्चिक	मध्यमविष वृश्चिक	महाविष वृश्चिक
1. Poison	Possess mild poison	Possess moderate poison	Possess virulent poison
2. Number	12	3	15
3. Appearance (colour, texture etc)	These are black blue, dark blue, white, yellow, red and colour of cow's urine These are hairy and rough Abdomen is reddish or whitish	Found in red yellow and brown colours. Abdomen is smoke coloured red coloured.	May be found in white, bluish, reddish blue, reddish brown or multi Abdomen is reddish blue or reddish
4. Joints	Possess many joints in the tail	Possess 3 joints in the tail.	Possess 0-2 joints in the tail
5. Origin	Arises from putrid cowdung	Originate from decayed wood/bricks	Origination from putrified dead bodies of snakes
6. Signs and Symptoms	Pain fever, trembling, stiffness of body, black blood discharge, sweating, swelling and burning sensation.	Inflammation of tongue, severe fainting and obstruction of food.	Pain, fainting, fever, swelling of tongue, rigidity of body parts, vomiting the black blood perspiration, dryness of mouth, eruptive boils.
7. Treatment	• The site should be irrigated with चक्रतैल • Fomented with उत्कारिका • Poultice should	• Should be treated as if bitten by snake. • Site should be fomented and scarified powder of हरिद्रा, सैधव त्रिकटु, शिरिष are rubbed over the site • Paste of tender leaves of तुलसी with मातुलुङ्ग and cow's urine in used.	

be applied with antipoisonous drugs.

- Well cooked jaggery water with चातुर्जात is intaken.

- The site must be fomented with warm cowdung.

- Milk/honey along with ghee and sugar is intaken

Scorpion:

Scientific classification

Kingdom	Animalia
Phylum	Arthropoda
Subphylum	Chelicerata
Class	Arachnida
Order	Scorpiones
	Superfamilies
	Pseudochactoidea
	Buthoidea
	Chaeriloidea
	Chactoidea
	Iuroidea
	Scorpionoidea



Hottentotta tamulus



Heterometrus Bengalensis

- A scorpion is an invertebrate animal with eight legs belonging to the order Scorpiones in the class Arachnida.
- Out of 1500 scorpion species, 50 are dangerous to humans.
- Almost all of these lethal scorpions, except the Hemiscorpius species, belong to the scorpion family called the Buthidae, the lethal members of the Buthidae family include the genera of Buthus, Parabuthus, Mesobuthus, Tityus, Leiurus, And-roctonus, and Centruroides.
- Scorpions use their pincers to grasp their prey; then, they arch their tail over their body to drive their stinger into the prey to inject their venom, sometimes more than once.
- The scorpion can voluntarily regulate how much venom to inject with each sting.

Scorpion Venom:

- All species of scorpion possess venom.

- Scorpion venom is a water-soluble, antigenic, heterogenous mixture.
- The venom is composed of varying concentrations of neurotoxin, cardiotoxin, nephrotoxin, hemolytic toxin, phosphodiesterases, phospholipases, hyaluronidases, histamine, serotonin, tryp-tophan, and cytokine releasers.
- The most potent toxin is the neurotoxin.

Signs and Symptoms:

- The signs of the envenomation are determined by the scorpion species, venom composition, and the victim's physiological reaction to the venom.
- The signs occur within a few minutes after the sting and usually progress to a maximum severity within 5 hours.

Local Effects:

- Local evidence of a sting may be minimal or absent in as many as 50% of cases of neurotoxic scorpion stings.
- A sharp burning pain sensation at the sting site, followed by pruritus, erythema, local tissue swelling, and ascending hyperesthesia, may be reported.
- A macule or papule appears initially at the sting site, occurring within the first hour of the sting, progresses to a purpuric plague that will necrose and ulcerate.
- Pain, erythema, induration, and wheal may be present. These are secondary to venom activation of kinins and slow-releasing substances.

Neurological Signs:

- Most of the symptoms are due to either the release of catecholamine from the adrenal glands (sympathetic nerves) or the release of acetylcholine from postganglionic parasympathetic neurons.
- Thalamus-induced systemic paresthesia occurs in all 4 limbs.
- Patients experience venom-induced cerebral thrombosis strokes.
- The level of consciousness is altered, especially with restlessness, confusion, or delirium.
- Patients have abnormal behavior.
- Ataxia is also a sign.
- Rigid spastic muscle of the limbs and torso may be noticed.
- Involuntary muscle spasm, twitching, clonus, and contractures.
- Alternating episthotonos and opisthotonus from inactivation of sodium channels.
- Piloerection accompanied by goose pimples.

- Intense local burning pain with minimal swelling at sting site, followed by ascending numbness and tingling, then paralysis and convulsions.

Cardiovascular Signs :

- Hypertension secondary to catecholamine and renin stimulation, observed as early as within 4 minutes after the sting and lasts a few hours.
- Hypotension-Less common and occurs secondary to excess acetylcholine or catecholamine depletion.
- Tachycardia is greater than 130 beats per minute, although bradycardia can be observed.
- Cardiovascular collapse occurs secondary to biventricular dysfunction and profuse loss of fluids from sweating, vomiting, diarrhea, and hypersalivation.
- Mild envenomation-Vascular effect with vasoconstriction hypertension.
- Moderate envenomation-Left ventricular failure hypotension with and without an elevated pulmonary artery wedge pressure, depending on fluid status of the patient.
- Severe envenomation-Biventricular cardiogenic shock.

Respiratory Signs :

- Tachypnea may be present.
- Pulmonary edema with hemoptysis and a normal-sized heart is observed in 7-32% of respiratory cases.
- Respiratory failure may occur secondary to diaphragm paralysis.

Allergic Signs :

- Urticaria.
- Angioedema.
- Bronchospasm.
- Anaphylaxis.

Gastrointestinal Signs :

- Excessive salivation, dysphagia.
- Nausea and vomiting
- Gastric hyper distention occurs secondary to vagal stimulation.
- Increased gastric acid output may lead to gastric ulcers.
- Acute pancreatitis may lead to hyperglycemia.
- Liver glycogenolysis may occur from catecholamine stimulation.

Genitourinary Signs :

- Patients have decreased renal plasma flow.
- Toxin-induced acute tubular necrosis renal failure may occur.
- Rhabdomyolysis renal failure may result from venom-induced excessive motor activity.
- Priapism may occur secondary to cholinergic stimulation.

Hematological Signs :

- Platelet aggregation may occur because of catecholamine stimulation.
- Disseminated intravascular coagulation with massive hemorrhage may result from venom-induced defibrination.

Treatment :

Local pain (sometime associated with local paresthesia, erythema, ecchymosis, blisters)

Aspirin 10 mg/kg orally every 4 hours

Mild systemic envenoming: Hyperthermia, tachycardia, arrhythmia, dyspnea, hypertension/hypotension, priapism Hypersecretory syndrome, abdominal distension, abdominal cramps dysfunction of either skeletal or cranial muscles, confusion, agitation, fasciculation, dystonia, vision disorders, ptosis, aberrant eye movements etc

1. Immunotherapy: dose depending on antivenom titer
2. Prazosin 30 μ g/kg orally every 6 hours
3. Midazolam 0.05–0.2 mg/kg orally or IV (or diazepam 0.5 mg/kg IV or rectally) every 12 hours

Life-threatening envenoming: multivisceral failure, heart failure, cardiogenic shock, pulmonary edema, Diaphoresis, dysfunction of both skeletal and cranial muscles, convulsions, paralysis etc. Biological disorders: Increasing biomarkers of cellular necrosis, electrolytic

Transfer to ICU

anomalies (decrease of Na^+ and Ca^{++} , increase of K^+)

Passive Immunotherapy

Antivenom should be administered as earlier as possible, and intravenously for better diffusion and to facilitate complication with the venom.

Symptomatic Treatment

Symptomatic treatment should be given accordingly.

मूषिक विष (Poisoning by Rat)

मूषिक भेद : Types of मूषिकः

According to Ayurveda, 18 varieties of mooshika are explained. These include lalana, putraka, krisna, hamsira, chikkira, chucchundara, alasa, kashaya dasana, kulinga, ajita, chapala, kapila, kokila aruna, mahakrisna, undura, mahashweta, ardhakapila and kapotabha.¹

अधिष्ठान of विष in मूषिकः

Though mainly mooshika are poisonous by their shukra (semen), other adhistanas are also described which include nakha and danta which come into contact with the shukra.²

मूषिक विष लक्षण Signs and Symptoms :

जायन्ते ग्रन्थयः शोफाः कर्णिका मण्डलानि च। पिङ्कोपचयश्चोग्रो विसर्पाः किटिभानि च।

पर्वभेदो रुजस्तीव्र मूर्च्छाऽङ्गसदनं ज्वरः। दौर्बल्यमरुचिः श्वासो वमथुर्लोमहर्षणम्। (सु. क. ७/७-९)

The blood in humans vitiated by the poison of rats when its semen falls or is touched by rats nails, teeth etc, and leads to the development of the following signs and symptoms.

ग्रन्थयः शोफ	-	glandular swelling
कर्णिका	-	round elevated patches with small eruptions
मण्डल	-	discoloured patches
पीङ्कोपचयश्चोग्रो	-	profound multiple eruptions on the body.
विसर्पाः	-	erysepelas
किटिभ	-	skin lesion
पर्वभेद	-	pain in the joints
रुजस्तीव्र	-	severe pain

१. लालनः पुत्रकः कृष्णो हंसिराश्चिरस्तया। छुच्छुन्दरो अलसश्चैव कषाय दशनोऽपि च॥
कुलिङ्गश्चाजितश्चैव चपलः कपिलस्तया। कोकिलो अरुण संज्ञश्च महाकृष्णस्तथोन्दुरः॥
क्षतेन महता सार्धं कपिलेनाखुना तया। मूषिकश्च कपोताभस्तयैवाष्टादश स्मृताः॥ (सु. क. ७/३-६)
२. शुकं पतति यत्रैवं शुकस्पृष्टैः स्पृशन्ति वा। नख दन्तादिभिस्तस्मिन् गात्रे रक्तं प्रदुष्यति॥ (सु. क. ७/७)

मूर्च्छा	-	fainting
अङ्गसदन	-	debility on body parts
ज्वरः	-	fever
दौर्बल्य	-	weakness
अरुचि	-	loss of taste
श्वास	-	dyspnoea
वमथु	-	vomiting
लोमहर्षणम्	-	horripilations

Apart from the above, the other symptoms include¹

कोङ्ग	-	Skin lesion
भ्रम	-	giddiness
वेपथुः	-	shivering
स्नुति	-	horripilations
मूर्च्छा	-	fainting of long duration
दीर्घकालानुबन्धनम्		
श्लेष्मानुविद्ध	-	Repeated vomitings of large quantity of
बहु आखु		mucoid material appearing like young ones
पोतक छर्दनं सकृत्		of rats.

असाध्य लक्षणः Incurable Signs and Symptoms²:

मूर्च्छा	-	Fainting	ज्वर	-	fever
अङ्गशोफ	-	swelling of the body	शिरोगुरुत्व		heavyness of the head
वैवर्ण्य	-	discolouration	लाल	-	excessive salivation
क्लेद	-	exudation	शब्दाश्रुति	-	deafness
असृक् छर्दि-		vomiting mixed with blood.			

विवर्ज्य लक्षणः

The patient who develops the following signs symptoms must be refused for treatment.

शूनबस्तिं	-	swelling of the bladder
विवर्णौष्ठ	-	discolouration of lips
आख्याभैग्रन्थिभिश्चितम्	-	several small nodes resembling rats.
चुच्छुन्दुरु सगन्ध	-	body emitting smell of rats. ³

१. ग्रन्थयः श्वयथुः कोथो मण्डलानि भ्रमोरुचिः। शीतज्वरोतिरुक्सादो वेपथुः पर्वभेदनम्॥

रोमहर्षः स्नुतिर्मूर्च्छा दीर्घकालानुबन्धनम्। श्लेष्मानुविद्ध बह्वाशु पोतक छर्दनं सकृत्॥ (अ.सं.उ. ४६/६)

२. मूर्च्छाङ्गशोफ वैवर्ण्य क्लेद शब्दाश्रुतिज्वराः। शिरोगुरुत्वं लालसृक् छर्दिश्चासाध्य लक्षणम्॥ (सु.क.उ. ४६/८)

३. शूनबस्तिं विवर्णौष्ठमाख्याभैग्रन्थिश्चितम्। चुच्छुन्दुरु सगन्धं च वर्जयेदाखु दूषितम्॥ (अ.सं.उ. ४६/९)

चिकित्सा (Treatment):**१. दहन कर्म:**

Immediately after rat bite, the site should be burnt (cauterised) with shaft of an arrow or a mirror, if not there will be severe pain or formation of circular rings.¹

२. प्रच्छान:

The burnt area should be then incised/scraped and fluid drained out.²

३. लेपन:

After प्रच्छान, paste of shireesha, rajani, vakra, kumkuma and amrtavalli applied.³

४. वमन:

Vomiting is to be induced by drinking decoction of jalini, sukakhya or ankola or other vamaka dravyas.⁴

५. पेय पान:

Peya prepared with decoction of two pippali and ansumati destroys symptoms like abdominal pain, hiccup, loss of taste etc which is persisting after vama.⁵

६. विरेचन:

Purgation therapy must be administered with paste of trivrt, nili and triphala.⁶

७. शिरोविरेचन:

Purgation of the head is done with saara (gum/resin) and fruit of shireesha.⁷

८. अञ्जन:

Collyrium is prepared with juice of fresh cowdung added with fine powder of vyosa.⁸

९. अवलेह प्रयोग:

Avaleha prepared of fruit of kapittha added with juice of cowdung and honey.⁹

१०. घृतपान:

Medicated ghee prepared with roots of tanduliyaka or five parts of kapittha tree etc are used internally.¹⁰

१. आखुना दष्टमात्रस्य दंशं काण्डेन दाहयेत्। दर्पणेनाथवा तीव्ररुजा स्यात् कर्णिकान्यथा॥ (अ.सं.उ. ४६/१८)

२. दग्धं विस्त्रावयेदंशं प्रच्छितं। (अ.सं.उ. ४६/१९)

३.च प्रलेपयेत् शिरीष रजनी वक्र कुङ्कुमामृत वल्लिभिः॥ (अ.सं.उ. ४६/१९)

४. छर्दनं जालिनी कार्थैः शुकाख्याङ्गोलेयोरपि। (अ.सं.उ. ४६/२२)

५. द्विपिप्पलीब्धं शुमती क्वाथे पेया च तद् गुणा॥ (अ.सं.उ. ४६/२८)

६. विरेचने त्रिवृत्तिलीत्रिफला कल्क इष्यते॥ (अ.सं.उ. ४६/२९)

७. शिरोविरेचने सारः शिरीषस्य फलानि च॥ (अ.सं.उ. ४६/२९)

८. अञ्जने गोमयरसो व्योषसूक्ष्मरजोन्वितः। (अ.सं.उ. ४६/३०)

९. कपित्थ गोमयरसो मधुमानवलेहने। (अ.सं.उ. ४६/३०)

१०. तण्डुलीयक मूलेन सिद्धं पाने हितं घृतम्। (अ.सं.उ. ४६/३१)

११. कर्णिका पातनः

- The physician should remove the karnika in the wounds which are hard and painful, by incising and then purify the wound according to the predominant dosa.¹
- Several lepas have also been described for the removal of karnika.
- Poison of rats which are not expelled out, generally increases /aggravates during cloudy days. Then, treatment prescribed for dushi visha should be done.²

Rat Bites

- Rats are equipped with large teeth and administer painful bites when threatened.
- Healthy rats typically avoid people and prefer to be active when buildings are quiet. However, when disturbed, they will lunge and bite to defend themselves.
- Rat bites may be shallow or deep. Some display single puncture wounds, while others display multiple abrasions.
- Bleeding often occurs. The common symptoms of a rat bite are pain, redness, swelling around the bite and, if secondary infection occurs, a weeping, pus-filled wound.
- Diseases transmitted by rats may be directly from exposure to rat-infected feces, urine or bites and diseases indirectly transmitted to people by an intermediate arthropod vector such as fleas, ticks or mites.
- Rats also are a potential source of allergens.
- Their droppings, dander and shed hair can cause people to sneeze and experience other allergic reactions.

Diseases Directly Transmitted by Rats:

1. Rat-bite Fever:

- Rat-bite fever is an acute, febrile human illness caused by bacteria transmitted by rodents, in most cases, which is passed from rodent to human by the rodent's urine or mucous secretions.
- Alternative names for rat-bite fever include streptobacillary fever, streptobacillosis, spirillary fever, bogger, and epidemic arthritic erythema.
- It is a rare disease spread by infected rodents and can be caused by two specific types of bacteria streptobacillary and spirillary.
- The majority of cases are due to the animal's bite. It can also be transmitted through

१. स्थिराणां रुजतां वाऽपि व्रणानां कर्णिकां भिषक् । पाटयित्वा यथादोषं व्रणवच्चापि शोधयेत् ॥ (सु.क. ७/४२)
 २. मूषिकाणां विषं प्रायः कुप्यत्यध्रेष्वनिर्द्धतम् । तत्राप्येष विधिः कार्यो यश्च दूषीविषापहः ॥ (सु.क. ७/४१)

food or water contaminated with rat feces or urine or exposure to urine or bodily secretions of an infected animal.

- Other animals can be infected with this disease, including weasels, gerbils, and squirrels.
- Household pets such as dogs or cats exposed to these animals can also carry the disease and infect humans.

Signs and Symptoms of Streptobacillary Rat-bite Fever

- These include inflammation around the open sore, a rash can also spread around the area and appear red or purple.
- Other symptoms associated with streptobacillary rat-bite fever include chills, fever, vomiting, headaches, and muscle aches.
- Joints can also become painfully swollen and pain can be experienced in the back.
- Skin irritations such as ulcers or inflammation can develop on the hands and feet.
- Symptoms usually occur 3-10 days after an infected rat bites a person.
- Wounds heal slowly, so symptoms possibly come and go over the course of a few months.

Symptoms Associated with Spirillary Rat-bite Fever:

- These include issues with the lymph nodes, which often swell or become inflamed as a reaction to the infection.
- The most common locations of lymph node swelling are in the neck, groin, and underarm.
- Symptoms generally appear within 2 to 10 days of exposure to the infected animal.
- It begins with the fever and progresses to the rash on the hands and feet within 2 to 4 days.
- Rash appears all over the body with this form, but rarely causes joint pain.

2. Leptospirosis:

- Upto 13 different genetic types of *Leptospira* may cause disease in humans.
- It is transmitted by both wild and domestic animals.
- The most common animals that spread the disease are rodents.
- It is often transmitted by animal urine or by water or soil containing animal urine coming into contact with breaks in the skin, eyes, mouth, or nose.

- Leptospiral infection in humans causes a range of symptoms, and some infected persons may have no symptoms at all.
- Leptospirosis is a biphasic disease that begins suddenly with fever accompanied by chills, intense headache, severe myalgia, abdominal pain, conjunctival suffusion and occasionally a skin rash.
- The symptoms appear after an incubation period of 7–12 days.
- The first phase ends after 3–7 days of illness. The disappearance of symptoms coincides with the appearance of antibodies against *Leptospira* and the disappearance of all the bacteria from the bloodstream.
- The patient is asymptomatic for 3–4 days until the second phase begins with another episode of fever and meningitis.
- The classic form of severe leptospirosis is known as Weil's disease, which is characterized by liver damage causing jaundice, kidney failure, and bleeding.
- Other severe manifestations include extreme fatigue, hearing loss, respiratory distress, and azotemia.

3. Salmonellosis:

- Consuming food or water that is contaminated by rat feces bacteria can cause this disease.

4. Hantavirus Pulmonary Syndrome:

- This is a viral disease that is transmitted by the rice rat.
- This disease is spread in one of three ways: inhaling dust that is contaminated with rat urine or droppings, direct contact with rat feces or urine, and infrequently due to the bite of rat.

Diseases Indirectly Transmitted by Rats:

1. Plague:

- Plague is an infectious disease caused by the bacterium *Yersinia pestis*.
- Domestic rats are the most common reservoir of plague.
- *Yersinia pestis* circulates in animal reservoirs, particularly in rodents.
- It is mainly a disease in the fleas (*Xenopsylla cheopis*) that infest the rats, making the rats themselves the first victims of the plague.
- Infection in a human occurs when a person is bitten by a flea that has been infected by biting a rodent that itself has been infected by the bite of a flea carrying the disease.

- The bacteria multiply inside the flea, sticking together to form a plug that blocks its stomach and causes it to starve.

headache, weakness and spitting or vomiting of blood.

- The course of the disease is rapid; unless diagnosed and treated soon enough, typically within a few hours, death may follow in one to six days.

2. Colorado Tick Fever:

- This is a viral disease that is transmitted by the bite of a tick that has taken a blood meal from a bushy-tailed woodrat.

3. Cutaneous Leishmaniasis:

- This disease is a parasite that is transmitted to a person by the bite of an infected sand fly that has fed on a wild woodrat.

अलर्क विष (Rabies Poison)

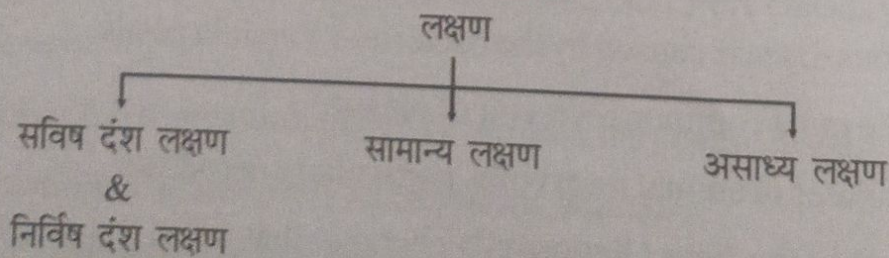
निदान: Cause of अलर्क विष:

When vata gets aggravated in the body of dog, fox, jackal, hyena, bear, tiger etc, it combines with the aggravated kapha and accumulates in the channels of their sense organs and causes loss of sensation or hampers the consciousness.^{1,2}

Signs and Symptoms in the Animal Affected³:

प्रस्रस्त लाङ्गूल	- hanging its tail
हनु	- drooping down of lower jaw
स्कन्ध	- drooping of its shoulders.
अतिलालवान्	- copious flow of saliva from the mouth
अत्यर्थं बधिर	- animal is intensely deaf
अत्यर्थं अंध	- animal is intensely blind
अन्योन्यमभिधावति	- animal moves here and there.

अलर्क विष लक्षण : Features of Rabies Poison:



१. श्व शृगाल तरक्ष्वक्ष व्याघ्रादीनां यदाऽनिलः। श्लेष्म प्रदुष्टो मुष्णाति संज्ञां संज्ञावहाश्रिताः॥ (सु.क. ७/४३)
२. शुनः श्लेष्मोल्बणा दोषाः संज्ञां संज्ञावहाश्रिताः। मुष्णन्तः कुर्वते क्षोभं धातूनामति दारुणम् ॥ (अ.सं.उ. ४६/१०-११)
३. तदः प्रस्रस्त लाङ्गूल हनु स्कन्धो अतिलालवान्। अत्यर्थं बधिरो अन्धश्च सोऽन्योन्य अभिधावति॥ (सु.क. ७/४४)

सामान्य लक्षण : (General Signs and Symptoms):

दंशस्तेन विदष्टस्य सुप्तः कृष्णं क्षरत्यसृक् ।

हृच्छिरोरुक् ज्वर स्तम्भ तृष्णा मूर्च्छोद्भव अनु च ।। (अ.सं.उ. ४६/१२)

Bitten by a rabid dog, the person develops loss of sensation at the bite site, black coloured blood comes out from the site of bite, he develops pain in the heart, head, fever, rigidity, thirst and fainting.

सविष and निर्विष दंश लक्षण :

The symptoms of bites having poison in them include.¹

कण्डू	-	Itching
निस्तोद	-	Pain
वैवर्ण्य	-	Discolouration
सुप्ति	-	loss of tactile sensation
क्लेद	-	exudation
ज्वर	-	fever
विदाह	-	burning sensation in the abdomen
राग	-	site of bite becomes red
रुक्	-	pain
पाक	-	suppuration
शोफ	-	swelling
ग्रंथि निकुञ्जन	-	development of cystic swellings
दंशावदरण	-	contractures
स्फोट	-	tearing and falling of muscles
कर्णिका	-	development of round patches
मण्डल	-	development of swelling like lotus seed

The bites without above symptoms are said to be nirvisha.

असाध्य लक्षण : (Incurable Features):

दष्टो येन तु तच्चेष्टा रुतं कुर्वन् विनश्यति । पश्यंस्तमेव च अकस्मादादर्श सलिलादिषु ।।

The person bitten by a rabid animal imitates the animal in actions and voice, sees them in mirrors, water etc without any reason and finally dies.

¹ कण्डू निस्तोद वैवर्ण्य सुप्ति क्लेद ज्वर भ्रमाः । विदाह राग रुक्पाक शोफ ग्रन्थि निकुञ्जनम् ।।
दंशावदरणं स्फोटाः कर्णिका मण्डलानि च । सर्वत्र सविषे लिङ्गं विपरीतं तु निर्विषे ।। (अ.सं.उ. ४६/१५)

जलसंत्रासः (Hydrophobia):

The condition called jalasantrasa is explained which is also an asadhya lakshana of alarka visha.

त्रस्यति अकस्मात् यो अभीक्ष्णं दृष्ट्वा स्पृष्ट्वा आपि वा जलम्।

जलत्रासं तु विद्यात्तं रिष्टं तदपि कीर्तितम्।। (सु.क. ७/४८)

When the person bitten by a rabid dog becomes afraid even by seeing or touching water, without any cause, the condition is called as Jalasantrasa which is to be considered as fatal.

जलदर्शनं संस्पर्श शब्देभ्यो यश्च सन्त्रसेत्।

अदृष्टमपि तं जहाज्जल सन्त्रास रोगिणम्।। (अ.सं.उ. ४६/१७)

He who gets frightened by the sight, touch and sound of water, should be considered as a patient of jalasantrasa which is a fatal sign.

अलर्क विष चिकित्सा :

१. विस्त्रावण/रक्तमोक्षण :

The blood should be removed from bite site.¹

२. दहनः

The site of bite should be burnt with hot ghee.²

३. प्रदेहः

Agada is applied as warm poultice on the bite site.³

४. पुराण सर्पि पानः

Later, patient is to be made to drink old ghee.⁴

५. लेपः

Roots of nala macerated with water is beneficial for pana and lepa.⁵

६. शोधन/विरेचनः

Patient should be administered a purgative drug along with milky sap of arka.⁶

७. नस्य-अञ्जन-लेप-पानः

Lasuna, ushana, vaidehi and vara macerated with ox bile is used for nasya, anjana, lepa and pana.⁷

१. दंश विस्त्राव्य तैर्दष्टे.....। (सु.क. ७/५०)

२. दंशत्वलर्क दष्टस्य दग्धमुष्णेन सर्पिषा। (अ.सं.उ. ४६/६४)

३. पदिष्ट्यादगदैस्तैः। (अ.सं.उ. ४६/६४)

४.पुराणं च घृतं पिबेत्। (अ.सं.उ. ४६/६४)

५. ब्रलमूलं जले पिष्टं पान लेपनयोर्हितम्।। (अ.सं.उ. ४६/६४)

६. अर्कक्षीरयुतं चास्य योज्यमाशु विरेचनम्। (अ.सं.उ. ४६/६७)

७. लशुनोषण वैदेही वश गोपित कल्किताः। पान नस्य अञ्जनालेपैः श्वदष्टस्यौषधं परम्।। (अ.सं.उ. ४६/७१)

८. शरपुङ्ख प्रयोग (Sharpunkha Prayoga):

This is a special treatment explained for alarka visha.

Root of sharapunkha	-	1 कर्ष	} Macerated with required quantity of tandulodaka and paste is prepared.
Root of धतूर	-	1/2 कर्ष	
तण्डुल (Rice)	-	as required	

This ball of paste is enveloped with leaves of dhatura and aapoopa or pan cake is prepared out of it. This aapoopa is to be consumed at the time of meals (mid-day) by the person suffering from poison of rabid dog for complete nullification of the poison.¹

The use of these cakes may cause some other complications at the time of its digestion which should be subdued by retiring the patient to a dry and cool chamber away from water. After the symptoms subsides, the patient should be given bath the next day, he must be made to take warm meals of shashtika shali along with milk.²

This treatment should be done for 3 or 5 days with half the quantity of mentioned drugs.

9. Snana Vidhi

One hundred and eight pots are filled with water, precious gems and potent herbs. A place near a river, meeting of four roads or a sacrificial ground, of the size of a cow's hide is selected, cleaned, washed with cow dung water and covered with kusha grass. The pots are placed on this place, decorated with garlands and their mouth covered.

Fire is lit near by, the pots are santified with holy hymns 108 times. The person bitten by a rabid dog is then given a ceremonial bath with water in the pots, chanting hymns.³

10. Shodhana

After snana vidhi, the person should be administered with strong purificatory therapies because in a person who is not purified well, the alarka visha gets aggravated again, though the wound has healed.⁴

१. मूलस्य शरपुङ्खायाः कर्षं धतूरकार्धिकम्॥ तण्डुलोदकमादाय पेषयेत्तण्डुलैः सह॥
उन्मत्तकस्य पत्रैस्तु संवेष्टयापूपकं पचेत् । खादेदौषधकाले तमलर्कं विष दूषितः॥ (सु. क. ७/५३)
२. करोति श्रविकारांस्तु तस्मिञ्जीर्यति चौषधे । विकाराः शिशिरे याप्या गृहे बारिविवर्जिते ॥
ततः शान्तविकारास्तु स्नात्वा चैवापरेऽहनि । शालिषष्टिकयोभक्तं क्षीरेणोष्णो न भोजयेत् ॥ (सु. क. ७/५५)
३. सरत्न बीजौषधिभिः कुम्भैः शीताम्बु पूरितैः । अष्टोत्तरशतं वारान् सिद्ध मन्त्राभि मन्त्रितैः॥
अष्टोत्तर शतोन्मानैः पुष्प मालावगुण्जितैः । गोचर्म मात्रके लिप्ते ज्वलिताग्नौ कुशास्तृते॥
स्थण्डिले सरित स्तीरे स्नानं वास्य चतुष्पथे । अलर्काधिपते यक्ष सारमेयगणाधिप॥
अलर्क जुष्टमेनं मे निर्विषं कुरु माऽचिरात्॥ (अ. सं. उ. ४६/७९-८१)
४. दद्यात् संशोधनं तीक्ष्णमेवं स्नातस्य देहिनः । अशुद्धस्य सरुढेऽपि व्रणे कुप्यति तद्विषम् ॥ (सु. क. ७/६२)

Rabies

- Rabies is caused by Lyssa Virus.
- It is spread when an infected animal scratches or bites another animal or human.
- Saliva from an infected animal can also transmit rabies if the saliva comes into contact with the eyes, mouth, or nose, treatment is almost never effective and mortality is over 99%.

Rabies Progresses in Five Distinct Stages:

- Incubation
- Prodrome
- Acute Neurologic period
- Coma
- Death

Incubation Period :

- This is the time before symptoms appear.
- The incubation period is typically 1–3 months in humans.
- Incubation periods as short as four days and longer than six years have been documented, depending on the location and severity of the contaminated wound and the amount of virus introduced.
- The closer the bite is to the brain, the sooner the effects are likely to appear.

Prodrome:

Early, flu-like symptoms including:

- A fever of 100.4°F/38°C or above.
- Headache
- Anxiety
- Feeling generally unwell
- Sore throat and a cough
- Nausea and vomiting
- Discomfort may occur at the site of the bite

These can last from 2 to 10 days, and they worsen over time.

Acute Neurologic Period:

Neurologic symptoms develop, including:

- Confusion and aggression

- Partial paralysis, involuntary muscle twitching, and rigid neck muscles
- Convulsions
- Hyperventilation and difficulty in breathing
- Hypersalivation or producing a lot of saliva, and possibly frothing at the mouth
- Fear of water, or hydrophobia, due to difficulty in swallowing
- Hallucinations, nightmares, and insomnia
- Priapism, or permanent erection, in males
- Photophobia, or a fear of light
- Toward the end of this phase, breathing becomes rapid and inconsistent.

Coma and Death :

- If the person enters a coma, death will occur within a matter of hours, unless they are attached to a ventilator.

Hydrophobia (Fear of water):

- It is the historic name for rabies.
- It refers to a set of symptoms in the later stages of an infection in which the person has difficulty in swallowing, shows panic when presented with liquids to drink, and cannot quench their thirst.
- Any mammal infected with the virus may demonstrate hydrophobia.
- Saliva production is greatly increased, and attempts to drink, or even the intention or suggestion of drinking, may cause excruciatingly painful spasms of the muscles in the throat and larynx.
- This can be attributed to the fact that the virus multiplies and assimilates in the salivary glands of the infected animal with the effect of further transmission through biting.
- The ability to transmit the virus would decrease significantly if the infected individual could swallow saliva and water.

Management:

Eliminating rabies in dogs:

- Rabies is a vaccine-preventable disease.
- Vaccinating dogs is the most cost-effective strategy for preventing rabies in people.
- Dog vaccination reduces deaths attributable to rabies and the need for PEP as a part of dog bite patient care.

Awareness on Rabies and Preventing Dog Bites:

- Education on dog behaviour and bite prevention for both children and adults is an essential extension of a rabies vaccination programme and can decrease both the incidence of human rabies and the financial burden of treating dog bites.
- Increasing awareness of rabies prevention and control in communities includes education and information on responsible pet ownership, how to prevent dog bites, and immediate care measures after a bite.

Preventive Immunization in People:

Pre-Exposure Prophylaxis (PrEP):

- Human rabies vaccines exist for pre-exposure immunization.
- Pre-exposure vaccination may be offered to high risk groups like laboratory staff handling the virus and infected material, clinicians and persons attending to human rabies cases, veterinarians, animal handlers and catchers, wildlife wardens, quarantine officers and travelers from rabies free areas to rabies endemic areas.
- The Indian Academy of Pediatrics (IAP) has recommended pre-exposure prophylaxis of children.

Schedule of Vaccination:

- Pre-exposure vaccination is administered as one full dose of vaccine intramuscularly or 0.1 ml intra-dermally on days 0, 7 and either day 21 or 28.
- Laboratory staff and others at high continuing risk of exposure should have their neutralizing antibody titres checked every 6 months during the initial two years period after the primary vaccination.
- If it is less than 0.5 IU/ml a booster dose of vaccine should be given.
- Subsequently, sero-monitoring is recommended every two years.
- Because vaccine-induced immunological memory persists in most cases for years, a booster would be recommended only if rabies virus neutralizing antibody titers have dropped to less than 0.5 IU/ml.

Post-exposure Prophylaxis (PEP):

- Post-exposure prophylaxis (PEP) is the immediate treatment of a bite victim after rabies exposure.
- This prevents virus entry into the central nervous system, which results in imminent death.
- Depending on the severity of the contact with the suspected rabid animal, administration of PEP is recommended as follows.

- Individuals with WHO category II or III exposures should receive PEP without delay.

The WHO Rabies Exposure Categories are as follows:

Categories of contact with suspect	Post-exposure prophylaxis measures
Rabid animal	
Category I - Touching or feeding animals, licks on intact skin	None
Category II - Nibbling of uncovered skin, minor scratches or abrasions without bleeding	Immediate vaccination and local treatment of the wound
Category III - Single or multiple transdermal bites or scratches, licks on broken skin; contamination of mucous membrane with saliva from licks, contacts with bats.	Immediate vaccination and administration of rabies immunoglobulin; local treatment of the wound

- **Approach to Post-Exposure Prophylaxis (PEP):** The post-exposure prophylaxis is a three-pronged approach. All three carry equal importance and should be done simultaneously as per the category of exposure:

1. Management of animal bite wound
2. Passive immunization with Rabies Immunoglobulin (RIG)
3. Active immunization with Anti-Rabies Vaccines (ARV)

1. Management of Animal Bite Wound:

- All bite wounds and scratches should be attended to as soon as possible after the exposure; thorough washing and flushing of the wound for approximately 15 minutes, with soap or detergent and copious amounts of water, is required.
- Where available, an iodine-containing, or similarly viricidal, topical preparation should be applied to the wound.
- Suturing of wound should be avoided as far as possible.
- If surgically unavoidable, after adequate cleansing, rabies immunoglobulin should be infiltrated in the depth and around the wound and suturing should be delayed by a few hours which allows diffusion of antibodies in the tissues.
- Minimum loose sutures should be applied for arresting the bleeding in life threatening situations.

- Tetanus and antibiotic prophylaxis should be given if required to prevent sepsis in the wound.

2. Passive Immunization:

- The anti-rabies serum/Rabies Immunoglobulin (RIG) provides passive immunity in the form of ready-made anti-rabies antibodies, before it is physiologically possible for the victim to begin producing his/her own antibodies following anti-rabies vaccination.
- Anti-rabies serum or RIG has the property of binding with the rabies virus, thereby resulting in neutralization and thus loss of infectivity of the virus and hence it is most logical to infiltrate RIG locally at the site of exposure.

Types of RIGs:

A. Equine Rabies Immunoglobulin (ERIG):

- ERIG is of heterologous origin produced by hyperimmunisation of horses.
- The dose of ERIG is 40 IU per kg body weight of patient.

B. Human Rabies Immunoglobulin (HRIG):

- HRIG are of homologous origin and are relatively free from the side effects encountered in a serum of heterologous origin.
- The dose of the HRIG is 20 IU per kg body weight.

Administration:

- The RIG should be brought to room temperature (25°C to 30°C) before administration to the patient.
- As much of the calculated dose of RIG as is anatomically feasible should be infiltrated into and around the wound.
- Multiple needle injections into the wound should be avoided.
- The total recommended dose of RIG must not be exceeded as it may suppress the antibody production stimulated by the anti-rabies vaccine.
- Rabies immunoglobulin for passive immunization is administered only once, preferably within 24 hours after the exposure (on day 0 along with the first dose of anti-rabies vaccine).
- If RIG was not administered when ARV was begun, it can be administered up to the seventh day after the administration of the first dose of ARV.
- Beyond the seventh day (after 3 doses of vaccine have been administered), RIG is not

indicated since an antibody response to ARV would have occurred and administration of RIG at this stage can suppress the immune response of the patient to the ARV received.

- Rabies Immunoglobulin should never be administered in the same syringe or at the same anatomical site as vaccine.
- The dose is 0.5 ml of 0.1 percent solution (1 in 1000, 1mg/ml) for adults and 0.01ml/kg body weight for children, injected subcutaneously or IM.
- RIG must never be given intravenously.
- A full course of ARV should follow thorough wound cleansing and passive immunization.

3. Active Immunization:

- The first live attenuated injectable rabies vaccine, developed by Louis Pasteur and Emile Roux, was first tested in a human bite victim in 1885.
- It was based on inactivated homogenates of RABV-infected rabbit nerve tissue.
- Since 1984, WHO has strongly recommended discontinuation of production and use of nerve tissue vaccines and their replacement by modern, concentrated, purified cell culture and embryonated egg-based rabies vaccines (CCEEVs).
- CCEEVs are intended for use in both PrEP and for PEP.
- CCEEVs contain inactivated RABV that has been grown in embryonated eggs (e.g. embryonated duck or chicken eggs) or in cell culture (e.g. primary chick embryo cells, Vero cells or human diploid cells).
- The viral harvest is concentrated, purified, inactivated and lyophilized
- Rabies vaccines for humans should meet WHO recommendations for manufacturing and clinical evaluation.

Post-exposure Prophylaxis (PEP) According to Category of Exposure:

Category I Exposure	Category II Exposure	Category III Exposure
Washing of exposed skin surfaces.	Wound washing and immediate vaccination	Wound washing and immediate vaccination.
No PEP required.	2-sites ID on days 0, 3 and 7	2-sites ID on days 0, 3 and 7

OR

OR

1-site IM on days 0, 3, 7
and between day 14–28

OR

2-sites IM on days 0 and
1-site IM on days 7, 21

RIG is not indicated.

1-site IM on day 0, 3, 7
and between day 14–28

OR

2-sites IM on days 0
and 1-site IM on days
7, 21

RIG administration is
recommended.

Post-Exposure Prophylaxis:

Intra-muscular (IM) Regimen:

A. Cell Culture Vaccines:

1. Human Diploid Cell Vaccine (HDCV) – 1 ml
2. Purified Chick Embryo Cell Vaccine (PCECV) – 1 ml
3. Purified Vero Cell Rabies Vaccine (PVRV), 0.5ml and 1ml

B. Purified Duck Embryo Vaccine (PDEV), 1ml

Regimen:

Essen regimen / The 5 dose intramuscular regime: (1-1-1-1-1)

- One dose of the vaccine should be administered on days **0, 3, 7, 14 and 28**.

Zagreb regimen / The 4 dose intramuscular regime (2-1-1)

- **2 doses** on day **0** (one in each of the 2 deltoid or thigh sites)
- **1 dose** on days **7 and 21**.
- In both the above, vaccines should be injected into the deltoid muscle for adults and children aged 2 years and more.
- The anterolateral thigh is recommended for younger children.
- Vaccines should not be injected into the gluteal region because the fat present in this region retards the absorption of antigen and hence impairs the generation of optimal immune response.

Intradermal Regimen

- The intradermal (ID) regimen requires a reduced volume of vaccine to be utilised than any of the IM regimens.
- The volume per intradermal (ID) site is 0.1 ml.
- The vaccines should have stated potency of 2.5 IU per IM dose, the same vaccine is

used for ID administration as per stated schedule.

- Vaccine administered ID must raise a visible and palpable "bleb" in the skin.

Regimen:

Thai Red Cross Schedule (Modified) / The 2-site intradermal regimen: (2-2-2-0-2):

One dose of vaccine, of 0.1 ml is given intradermally at two different lymphatic drainage sites on days- 0, 3, 7, 28

PVRV (purified vero cell rabies vaccine) - 0.1 ml

PCECV (Purified chick embryo cell vaccine) - 0.1 ml

PDEV (Purified duck embryo vaccine) - 0.2ml

"Oxford" regimen : 8-site intradermal method (8-0-4-0-1-1)

HDCV - 0.1 mL

PCECV - 0.1 mL

- Usually administered in the deltoid muscle on the left and right upper arm and suprascapular area.
- Given on days **0, 7, 28 and 90**.
- The day 0 is the date of first dose administration of anti-rabies vaccine and may not be the date of rabies exposure/animal bite.
- Adverse reactions following ID administration of anti-rabies vaccine may include mild itching, erythema, rarely body ache and fever that are usually self-limiting.
- Sometimes symptomatic management using analgesics and antihistamines may be needed.

Name of Regimen	Oxford Regimen 8 Site Intradermal Regimen	Thai Red Cross Regimen 2 Site Intradermal Regimen
Form of Vaccine used with dose	HDCV / PCECV - 0.1 ml	PVRV / PCECV - 0.1 ml or PCECV - 0.2 ml
Regimen	(8 - 0 - 4 - 0 - 1 - 1)	(2 - 2 - 2 - 0 - 2)
Dose and day	0.1 x 8 sites - day 0 0.1 x 4 sites - day 7 0.1 at 1 site - day 28 0.1 at 1 site - day 90	0.1 x 2 sites - day 0 0.1 x 2 sites - day 3 0.1 x 2 sites - day 7 0.1 x 2 sites - day 28

Important Questions

Long Questions:

1. Describe in detail the identification, General Signs and symptoms, Vignasara lakshana and chikitsa of Darveekara Sarpa.
2. Describe in detail the identification, general signs and symptoms, Vignasara lakshana and chikitsa of Mandali Sarpa.
3. Describe in detail the identification, General Signs and symptoms, Vignasara lakshana and chikitsa of Rajeeman Sarpa.
4. Describe in detail the poisoning due to Vrishchika.

Short Essay:

1. Visha vriddhi kshaya Karana.
2. Sarpa bhedha.
3. Sarpa Damsha prakara.
4. Vishotkarshaka hetu.
5. Composition of Snake Venom.
6. Anti snake venom/ASV
7. Keeta Visha
8. Loota Visha.
9. Alarka Visha
10. Rabies prophylaxis.

Short Answers:

1. Dashanga Agada.
2. Jalasantrasa.
3. Sharapunkha Prayoga.
4. Difference between Venemous and non-venemous snakes.
5. Hydrophobia
6. Bilwadi Gutika
7. Sarpanga abhihata.

Corrosive, Asphyxiant, Irritant and other Poisons

ACIDS AND ALKALIS

Acids & alkalis come under the category of corrosive poisons. A corrosive poison destroys & erodes the surface with which it comes into contact with.

Mode of Action of Corrosive Poisons:

The action of corrosive poisons are mainly based on acid-base reactions of amide hydrolysis & ester hydrolysis. Proteins, which are chemically composed of amide bonds are destroyed via amide hydrolysis while lipids, which have ester bonds are decomposed by ester hydrolysis. These amide hydrolysis & ester hydrolysis reaction lead to chemical burns.

When the corrosive agents come in contact with the body, an intense inflammatory reaction occurs in the first four to seven days. If the patient survives this period, the granulation stage will follow, in which fibroplasia and formation of the collagen begins. In case of ingested corrosive poisons, severe damages can occur to the stomach and pylorus. During the second & third week perforation in gastrointestinal tract may occur. In the third week, cicatrization stage starts and formation of the scar tissue may result in stricture. Diluted acids act as irritant poisons.

To summarise, the mechanism of action of corrosive poison include:

1. Destruction and corrosion of all tissues they come in contact with.
2. Coagulation necrosis due to precipitation of proteins.
3. Extraction of water from the tissues.
4. Conversion of hemoglobin into haematin.

Classification:

The corrosive poisons are classified as follows.

1. Mineral acids
 - (a) Sulphuric acid
 - (b) Nitric acid
 - (c) Hydrochloric acid
2. Organic acids
 - (a) Oxalic acid
 - (b) Carbolic acid
 - (c) Acetic acid

3. Vegetable acid (d) Salicylic acid
 - Hydrocyanic acid
 4. Alkalis (a) Sodium hydroxide
 (b) Potassium hydroxide
 (c) Ammonium hydroxide

General Signs and Symptoms of Corrosives:

- Mainly the corrosive poisons affect the gastro intestinal tract and to some extent the respiratory system. The signs and symptoms appear immediately after intake which include:
- Intense burning pain and corrosion in upper gastro intestinal tract from lips to the stomach.
- There are chemical burns along the line of trickling of acid along the angles of the mouth.
- There is vomiting of brown or black matter (due to hematin). The vomitus contains blood, mucous and mucous membranes.
- Vomitus is highly acidic or alkaline.
- In large quantities, there is erosion of the whole gastric mucous membrane.
- Intense thirst which is not satisfied since whatever water is consumed is vomited out.
- Due to excoriation of the lips, there is continuous flow of saliva along with blood and mucous.
- Dehydration.
- Voice becomes hoarse due to inflammation of epiglottis and larynx.
- There is dyspnoea due to odema of the glottis.
- Patient may go to shock.
- With acids there is constipation, with alkalies there is diarrhoea.
- Pupil is dilated.

Time of Death

Cause of Death

If death occurs in

Few hours

- Neurogenic shock

Oedema of glottis

within 1 day

- Perforation of stomach Peritonitis

within 1 week

- Pulmonary complications

Time of Death

1 week - 1 month

Few months to few years

Cause of Death

Sepsis

Malnutrition due to oesophageal strictures and scarring of the stomach.

Treatment:

In corrosive poisons- gastric lavage and emetics are contraindicated for fear of chances of perforation of stomach. In acid poisoning alkali carbonates are also contraindicated since CO_2 released would cause perforation.

- For acid poisoning water, milk, egg albumin, vegetable oil, soap solution, lime water, tooth paste, calcium oxide, magnesium oxide, aluminium hydroxide etc are administered.
- For alkali poisoning water and weak acids like vinegar and lime juice are orally given.
- Pain - Morphine
- For thirst - Ice sucking
- For fluid loss- IV fluids
- For shock and prevention of oesophageal stricture- corticosteroids.
- For oedema of glottis - Tracheostomy and artificial respiration.
- The surface excoriations are treated as burns.

Post-mortem Appearance:

They depend upon the quantity and strength of a corrosive and the time taken to die.

In short time deaths.

- Corrosion and destruction of upper gastro intestinal tract
- Gastric perforation
- Peritonitis
- Destruction of abdominal and thoracic viscera.

In Late Deaths

- Signs of repair
- scarring
- Healed trickle marks at angles of mouth

Medico-legal Aspects:

- Corrosive acids are commonly used for vitriolage.

- Accidental poisoning may occur in laboratory and in children.
- Rarely used for suicide or homicide.
- Mineral acids are sometimes used as abortifacients.

Sulphuric Acid **Oil of Vitriol- H_2SO_4**

Physical properties: It is a colourless, odourless, heavy, non-fuming, oily liquid with a burning taste. Commercial H_2SO_4 is usually brown or dark in colour.

Occupational exposure standard- 1 mg/m

Signs and Symptoms-

General signs and symptoms of corrosive poisons as stated above are noticed.

In Addition, the following Signs and Symptoms are Seen:

- Tongue is swollen, brown or black and at times may become a corroded and shapeless mass.
- Teeth are chalky white.
- Lips are swollen, corroded and black
- Marks of trickling are present on the angle of the mouth.
- Perforation of the stomach is very common.

Fatal Dose : 10-15 ml

Fatal Period : 12-24 hrs.

Additional P.M. Appearances:

- All organs which come in contact with the acid are black (carbonisation).
- Perforation of stomach is common.
- Stomach is contracted with black, corrugated mucous membrane and black contents.

Treatment :

As stated in general corrosive poisons.

Medico-legal Aspects:

As already stated.

Vitriolage :

Definition:

It is defined as throwing of any corrosive substance usually sulphuric acid, on the body of the other person to cause injury, disfigurement or death. Old electric bulbs filled with acids are often thrown.

Since commonly used is Sulphuric acid (Oil of Vitrol), hence the name Vitriolage.

Substances Used :

Various substances which can be used for Vitriolage are Sulphuric acid, Nitric acid, Hydrochloric acid, Carbolic acid, Sodium hydroxide, Potassium hydroxide, Iodine, Bromine and marking nut juice.

Purpose:

The purpose of vitriolage is to take revenge or it is done in a fit of anger or for jealousy.

Effects of Vitriolage

1. Chemical burns: Characterised by
 - (a) Discoloration and staining of clothes and body.
 - (b) Absence of vesication.
 - (c) Marks of trickling
 - (d) Absence of red line of demarcation.
 - (e) The chemical can be detected in the stains
 - (f) Scar resulting is keloid type.
2. Death (Due to neurogenic shock, severe burns or later due to infection)
3. Blindness, Corneal destruction or conjunctival oedema.
4. Grievous injury
 - (a) Permanent loss of vision of either eye.
 - (b) Permanent loss of hearing of either ear.
 - (c) Permanent disfiguration of face or head
 - (d) Pain for more than 20 days so that he can not do his daily routine work.

Treatment

1. Wash the area with soap and water
2. Apply magnesium oxide
3. Care of body and eyes as in case of burn, using antibiotic, steroid ointments and eye drops.

Hydrochloric Acid

Muriatic Acid/Spirit of Salts- HCL

Physical Characteristics :

It is in the form of colourless gas or colourless liquid with irritating smell.

Additional Signs and Symptoms:

- 1) The manifestations are mild- It does readily destroy the skin, but damages the mucous membrane which turns grey then brown/black due to production of acid haematin.
- 2) Either there is no staining of skin, clothes and tissue or rarely it may be white and very rarely they may be black/reddish brown.
- 3) In few, there may be convulsion, delirium and paralysis.
- 4) Chronic poisoning may occur due to inhalation of fumes. It is characterised by coryza, conjunctivitis, corneal ulcer, pharyngitis, laryngitis and bronchitis, inflammation of gums and loosening of the teeth.

Fatal Dose: 15-20 ml.

Fatal Period: 1-2 days.

Treatment: General line of treatment of corrosive poison.

Additional Post-mortem Appearance: Perforation of the stomach is uncommon.

Additional Medicolegal Aspects: It is used to erase writing in attempts at forgery. It is chiefly used in industry for preparing chlorine, for medicine purposes etc.

Nitric Acid**Red Spirit of Nitre / Aqua Fortis - HNO_3** **Physical Characteristics :**

1. When pure it is clear, colourless, liquid with choking smell.
2. It is a powerful oxidising agent and dissolves all metals except gold and platinum.
3. The brown colour of commercial or exposed HNO_3 is due to oxides of nitrogen (NO_2 , NO)

Additional Signs and Symptoms :

- The lips, tongue, teeth, skin and clothes are white initially and later yellow due to "Xantho proteic reaction" (Nitric acid reacts with organic proteins to cause nitration of phenyl group and thus, forms picric acid).
- Abdominal distention because of fumes is maximum with HNO_3 (among acids)
- Vomitus is yellowish brown
- Some times locked jaw (rare)
- Commonly-Oliguria or anuria and albumin and casts are present in urine.
- On inhalation, irritation of the eyes, lacrimation, photophobia, burning sensation in the throat, cough and dyspnoea.

- Immediate death can result due to suffocation.

Fatal Dose : 10-15 ml.

Fatal Period : 12-24 hrs. (The shortest recorded is 1 hr. 30 min).

In Children, death may occur within few minutes.

Treatment: General line of treatment of corrosive poison.

Additional Post-mortem Appearance :

- 1) Perforation of the stomach is less common.
- 2) All tissues which come in contact with the acid are yellow.

Medicolegal Aspects :

- Nitric acid is used for cleansing nickel ornaments and separating gold from other metals.
- Cases of poisoning by this acid are not very common, and are mainly accidental.

Hydrocyanic Acid and other Cyanides- HCN

Hydrogen cyanide (HCN) is a highly toxic chemical. Hydrocyanic acid or prussic acid is a bluish white solution of HCN in water. The group is known as Vegetable acid since hydrocyanic acid is present in certain fruits-plum, peach and bitter almonds. Hydrocyanic acid is used in chemistry laboratory, gold plating, fertiliser industry and for fumigation of ships, railway carriages etc.

Physical Characteristics: HCN is normally in the form of colourless gas with smell like bitter almonds and Potassium cyanide-KCN is a dirty white powder.

Mechanism of Action: Cyanides act as protoplasmic poisons by inhibiting the enzyme cytochrome oxidase (Chelation of ferric component of cytochrome), thus reducing oxygen utilisation in the cells resulting in cytotoxic hypoxia. Since the tissue respiration stops, death in cyanides is immediate. Death is due to hystotoxic anoxia.

Signs and Symptoms:

- Poisoning results on ingestion, inhalation and absorption through abraded skin.
- With large doses, sudden death can occur.
- With low doses giddiness, nausea, headache, confusion, dyspnoea, cyanosis, fine froth at nose and mouth, convulsion and dilated pupils.
- Breath has smell of bitter almonds.
- Inhalation of vapours of Hydrocyanic acid results in feeling of constriction in chest, throat, dizziness, vertigo, insensibility and death.
- Potassium cyanide which is strongly alkaline, causes corrosion of upper gastro

intestinal tract, epigastric pain, vomiting, cyanosis, oronasal froth.

- Dilatation of pupils imperceptible pulse, shallow respiration, coma and death.

Fatal Dose : For HCN - 60 mg

For KCN - 200 mg

Fatal Period : Usually death is immediate though sometimes it may be delayed by 2-10 min.

Treatment of Cyanide Poisoning: Treatment has to be immediate.

Object of Treatment:

- It is to avoid cyanogen-cytochrome combination and principle of treatment involves the conversion of Hb to methHb.
- Meth Hb with cyanides forms cynmeth Hb (Harmless). Sodium thiosulphate given I.V. combines with cyanide to form sodium thiocyanate which is excreted by the kidney.
- Nitrites convert Haemoglobin to meth haemoglobin.
Meth Hb + CN - Cyn meth HB (harmless)
 $\text{Na}_2\text{S}_2\text{O}_3 + \text{CN}$ - Sodium thiocyanate (excreted by kidney)

Regimen :

- I) 3 ampules of 0.2 ml. amyl nitrite are broken in handkerchief and given for inhalation (stop if systolic B.P. falls below 80)

+

10 ml. of 3% sodium nitrite is given IV.

+

50 ml. of 25% sodium thiosulphate $\text{Na}_2\text{S}_2\text{O}_3$ (hypo) is given.

- II) The other compounds which are useful in cyanide poisoning are:

- Dimethylaminophenol
- Methylene blue
- PAPP (Para aminopropiophenone)
- Cobalt acetate
- Saturated glucose solution

These compounds also convert Hb to Meth Hb.

- III) Hydroxocobalamine can also be used as with cyanides, it forms cyanocobalamine (Vit. B-12)
- IV) In case of consumption of low doses- emetics are given and gastric lavage is done, after specific treatment.

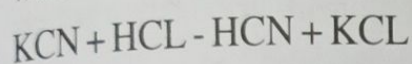
- V) In case of inhalation of cyanide, artificial respiration, oxygenation and coramine are given.

Post-mortem Appearance :

- 1) Cyanosis
- 2) Froth at nose and mouth
- 3) Post mortem lividity is pink in colour
- 4) Smell of bitter almonds from the stomach contents and body tissues.
- 5) Slight corrosion.
- 6) Features of asphyxia

Medicolegal Aspects :

- 1) KCN itself is not poisonous. It combines with gastric HCL acid to form HCN acid which causes toxic effects.



In case of absence of gastric HCL i.e. alchlohydria like in pernicious anaemia no poisoning occurs due to KCN.

- 2) In place where it is available, it is commonly used for suicide
- 3) It is sometimes used for homicide and as cattle poison.
- 4) Accidental poisoning in laboratories and industries is common.
- 5) Usually terrorists keep cyanide capsules and commit suicide when caught.

Oxalic Acid

Acid of Sugar, Salt of Sorrel ($\text{C}_2\text{H}_2\text{O}_4$)

Physical Properties :

Oxalic acid occurs in the form of colourless, transparent prismatic crystals, resembles in appearance the crystals of magnesium sulphate and zinc sulphate.

Action of Poison :

Local : Corrosive in action, though corrosion is not well marked on skin, but more in mucous membrane.

Remote Action :

- a) Shock : Large doses cause rapid death from shock.
- b) Hypocalcemia : Oxalic acid readily combines with the calcium ions in the body tissues and causes its withdrawal from them.
- c) Renal damage : Oxalates produce tubular necrosis and cause death from uraemia.

Signs and Symptoms :

a) Fulminating Poisoning :

- Large concentrated dose of 15 gm or more may produce immediate death within minutes.
- Sour, burning, bitter taste in the mouth.
- Constriction around the throat.
- Burning pain from mouth to stomach.
- Severe pain and tenderness
- Nausea, persistent vomiting with coffee-ground appearance.

b) Acute Poisoning :

- Marked by symptoms of hypocalcemia.
- There is muscle irritability and tenderness.
- Tetany
- Convulsions.
- Numbness and tingling of the fingertips and legs.
- Signs of cardio vascular collapse may appear.

c) Delayed Poisoning :

- Characterised by the symptoms of uraemia.
- Urine is scanty and may contain traces of blood, albumin and calcium oxalate crystals.
- Renal failure may occur.

Fatal Dose : 15-20 gm

Fatal Period : 1-2 hrs.

Treatment :

- Gastric lavage can be done-since corrosive action is mild, anyhow warm water should not be used as it may dissolve oxalic acid.
- Antidote : Any preparation of calcium which converts the poison into insoluble calcium oxalate eg. lime water, calcium lactate, calcium gluconate, calcium chloride, a suspension of chalk in water or milk.
- Calcium gluconate 10%, 10 ml IV at frequent intervals.
- Dialysis or exchange transfusion for renal failure.
- Parathyroid extract 100 units IM in severe cases.

P.M. Appearances :

- Corrosive action in stomach.
- Stomach is congested, softened and contains brown material.
- All internal viscera congested.
- Kidneys are congested and tubules are filled with oxalate crystals.

Medico legal Aspects :

- Accidental poisoning due to it being mistaken for magnesium sulphate or sodium bicarbonate.
- Suicidal and homicidal poisoning is rare.
- Used to erase writings in attempts of forgery.
- In the form of ammonium, sodium, potassium or calcium, oxalic acid exists as a natural constituent of several vegetables such as spinach, cabbages etc and hence may gain access to the body through food and drugs of vegetable origin.

Carbolic Acid**Phenol, Phenyl Alcohol or Phenic Acid**

- Crude carbolic acid is phenol
- It is obtained from coal tar oil by fractional distillation
- When pure, carbolic acid consists of short, colourless, prismatic, needle-like crystals, which have a burning sweetish taste, which turn pink and liquefy when exposed to air.
- It has a characteristic carbolic or phenolic smell
- Commercial carbolic acid is a dark brown liquid containing several impurities, chiefly cresol which is largely used as an antiseptic and disinfectant.
- Lysol is 50% solution of cresol in saponified vegetable oil.
- Dettol is a chlorinated phenol with turpineol.

Signs and Symptoms :

Poisoning by carbolic acid is known as carbolism

Local Action-**Skin :**

- Burning and numbness due to damage to nerve endings.
- It precipitates protein and coagulates the cell contents and stiffens the tissues, so that hard, cracked, whitish surfaces are seen on the face and skin.
- Deep burns are black and produce a white opaque eschar which is painless.

- There may be necrosis and gangrene of the tissue which becomes greenish white or brownish white.

GIT :

- Hot burning pain from mouth to stomach, nausea, vomiting.
- Painful deglutination and speech.
- Lips, mouth and tongue are corroded, become white and hardened.

Respiratory Tract :

- Pulmonary and laryngeal oedema.
- Slow and laboured breathing progressing to respiratory failure.

Systemic Effects :

- Phenol depresses the C.N.S.
- Headache, giddiness, unconsciousness, coma
- Respiratory alkalosis
- Metabolic acidosis
- Liver may be damaged
- In severe cases-haemolysis and meth hemoglobinaemia is characteristic feature.
- There is a strong odour of phenol in breath.

Urine :

- Scanty urine with albumin and free haemoglobin.
- Urine may be colourless or slightly smoky green at first then may turn green or even black on exposure to air for 20-30 sec, due to oxidation of metabolic products of carbolic acid. This is known as Carboluria.

Chronic Poisoning (Phenol Marasmus) :

- Characterised by anorexia, weight loss, headache, vertigo, dark urine and pigmentation of skin and sclera.
- In the body, phenol is partly oxidised to hydroquinone and pyrocatechol which may cause pigmentation in the cornea and cartilages a condition called Ochronosis.
- Death is usually due to respiratory or cardiac failure

Fatal Dose : 10-15 gms

Fatal Period : 3-4 hrs.

Treatment :

1. Stomach wash - with lukewarm water with activated charcoal, olive oil, castor oil etc.
2. Antidote- after lavage, 30gm of magnesium sulphate is left in stomach.
3. Demulcents

4. Haemodialysis if there is renal failure
5. Artificial respiration and oxygenation

P.M. Appearances :

- Corrosion of the skin, and mucous membrane.
- Smell of phenol from the mouth.
- Mucous membrane of upper gastro intestinal tract is congested and detached, there is greyish white staining of the viscera.
- The stomach becomes thick, leathery, and brown with thickened folds, projecting rugae, the contents are dark brown and mucoid and there is strong characteristic phenolic smell- this is known as leather bottle appearance.

Medico Legal Importance :

- Commonly used for suicide since it is used as disinfectant at home.
- Used for homicide by mixing with rum.
- Rarely used as abortifacient

Formic Acid (HCOOH)

Formic acid is a colourless liquid with a pungent, penetrating odour. It is used in electroplating, tanning, rubber, textile and paper industry, stain remover etc.

Mode of Action :

It has a corrosive action on gastro intestinal mucosa. It causes haemolysis leading to acute renal failure. ATP synthesis is diminished.

Signs and Symptoms :

G.I.T	:	Burning pain, salivation, vomiting, mucosal ulceration and corrosion, haematemesis.
Respiratory System	:	Acute respiratory distress
C.V.S	:	Tachycardia or bradycardia, hypertension or hypotension.
Blood	:	Haemolysis
C.N.S	:	Drowsiness, coma, dilated pupils
Skin	:	Blisters
Others	:	Metabolic acidosis, shock and death.

Fatal Dose: 50-200ml

Treatment :

1. Milk is given for dilution of acid.
2. Gastric lavage and emetics are contraindicated
3. Folinic acid 1 mg/kg IV at 4 hrly for 6 doses.
4. Dialysis or exchange transfusion.

P.M. Appearances :

- Corrosion and blackening of gastric mucosa.
- Pulmonary oedema

Medico Legal Aspects :

Poisoning is suicidal or accidental.

Alkalies

- Like acids, alkalies act as corrosive poisons when administered in the concentrated form and as irritants when diluted.
- Strong alkalies commonly produce oesophageal burns and oesophageal stricture is a major long-term complication.

Action :

- They are the commonest cause of chemical burns.
- They absorb water from the tissues, precipitate protein and cause liquefaction necrosis resulting in deeper penetration and saponification of fats with marked edema.
- Ingestion of an alkali produces severe effects on lining of oesophagus while gastric involvement is less common.
- Therefore stricture formation is more common with alkalis than with acids.
- Liquid alkalis cause less damage to oesophagus and more to the stomach.

Ammonia : NH_3

- Ammonia is a colourless gas with pungent, choking odour, used as a refrigerant and a fertiliser.
- When dissolved in water it forms liquor ammonia fortis which is largely employed for domestic purposes.

Potassium Hydroxide : KOH

- Usually in the form of hard, deliquescent, white pencils or cakes.
- It is soapy to touch, acrid to taste, rapidly absorbs carbon dioxide from the air, strongly alkaline.

Sodium Hydroxide: NaOH: Caustic Soda

- Occurs as solid masses or cylindrical sticks
- Is strongly caustic

Potassium Carbonate K_2CO_3

- It occurs as a white, crystalline powder with a caustic and alkaline taste.
- It is used for washing and other cleaning purposes

Sodium Carbonate : Washing Soda: $Na_2CO_3 \cdot 10H_2O$

- Occurs as large, transparent, monosymmetric crystals.
- A mixture of caustic soda and washing soda is known as lye/soap-lye and is used for cleansing purposes.

Signs and Symptoms:

- Lesions caused by caustic alkalis are of same extent and distribution as those of acids.
- There is caustic taste and sensation of burning heat from the throat to the stomach.
- The vomited matter is alkaline. It is first thick and slimy, but later contains dark altered blood and shreds of mucosa.
- Purging is frequent accompanied by severe pain and straining.
- Motion consists of mucus and blood.
- Blisters and brownish discolouration on lips and skin around the mouth.
- Mucosa of the gastro intestinal tract is soft, swollen with gray slough which readily detaches.

Fatal Dose:

Ammonia	:	30 ml
Potassium or sodium hydroxide	:	5 gm
Sodium and Potassium carbonate	:	15-30 gm.

Fatal Period: 24 hrs.**Treatment :**

- Gastric lavage or emetics are contraindicated.
- Dilute immediately with water
- Demulcents, egg white or milk may be given
- In ammonia vapour- oxygen inhalation
- Tracheostomy if necessary

- Parenteral analgesics and antibiotics

P.M. Appearances :

- Characteristic odor in case of ammonia
- Mucosa may be brownish due to formation of alkali hematin.

Medico-legal Aspects :

- Accidental poisoning is common in children.
- Few suicidal cases are seen, homicidal are rare

B. Asphyxiants-Irrespirable Gases

Asphyxiants mainly produce respiratory embarrassment. The important asphyxiants include carbon monoxide, carbon dioxide, hydrogen sulphide and some war gases.

Carbon Monoxide (Carbonyl Oxide Gas) :

It is a colourless, tasteless, non-irritative gas which cannot be perceived by the senses. It is produced by incomplete combustion of carbon and organic matter.

Sources :

- Smoke from defective heating appliances like furnace, stove, water heater, fire place etc.
- Exhaust of vehicular engines
- Burning fossil fuel
- Coal gas
- Dynamite and other explosives
- Industrial processes
- Illuminating gas. etc.

Mechanism of Action :

1. CO has 200-300 times greater affinity for haemoglobin than oxygen. It displaces oxygen and combines with haemoglobin to form carboxyhaemoglobin, hence reducing the oxygen content of blood and tissues. It acts as a chemical asphyxiant and produces death due to anaemic anoxia.
2. CO also exerts direct toxic effects by binding to cellular cytochromes.

Signs and Symptoms:

- The gas being odourless and non-irritant, the onset of symptom is insidious. The brain and heart extract the greatest percentage of oxygen therefore, these organs are the earliest to be affected.

- The symptoms of poisoning are often mistaken for symptoms of influenza or illness caused by contaminated food.
- Development of the symptoms corresponds to the rise in the saturation of blood by CO described as follows.

S.N.	COHb %	Signs and Symptoms
1.	0-10%	No appreciable symptoms
2.	10-20%	Shortness of breath on exertion, mild headache, lassitude and flushed skin.
3.	20-30%	Throbbing headache, buzzing in the ears, breathlessness, muscular weakness and incoordination, dulling of senses.
4.	30-40%	Severe headache, dizziness, nausea, vomiting, collapse on slight exertion, mental confusion, dim vision.
5.	40-50%	All above symptoms intensifies may be mistaken with drunkenness, incoordination, staggering, mental confusion, loss of memory, palpitation.
6.	50-70%	Intermittent asphyxial convulsions, coma, cheyne-stroke respiration, respiratory paralysis and death.
7.	>70%	Rapidly fatal due to respiratory arrest.

- The other symptoms are those of suboxia.
- Damage to the CNS may produce monoplegia or hemiplegia,
- Impairment of higher intellectual functions, personality changes etc may also be seen.
- Bullae may be formed which tend to be separate and isolated lesions, caused due to skin hypoxia.
- Bullous fluid is usually thick and cellular and there is often an inflammatory reaction in the surrounding skin.
- There is tendency of the dying victim to wild, erratic swinging movements inside the room, disturbing clothing and furniture which gives an impression of violent struggle. This condition is called as carbon monoxide automatism.
- CO can pass from the maternal to the foetal blood and can produce intrauterine death.

Chronic Poisoning :

Symptoms include headache, confusion, weakness, parasthesia, visual disturbances, hypertension, hyperthermia, palpitations, atrial fibrillation, AV block, mental retardation etc.

Severity of CO Poisoning :

Normal Carboxyhaemoglobin - COHb level is <5%, upto 9% in cigarette smokers. Serious toxicity is associated with levels >25% and risk of fatality at 70%.

Co Hb %	Severity of Poisoning
10-30	Mild
30-40	Moderate-severe
>40	Very severe

Fatal Dose and Fatal Period :

CO %	Fatality
0.2%	4 hrs
0.4%	1 hr
10%	1/2 hr

Treatment :

- Removal from the source of exposure.
- 100% oxygen untill COHb falls to 15-20%
- Maintain patent airway fresh air.
- Blood transfusion if required
- Gastric lavage to prevent aspiration pneumonia
- Antibiotics and symptomatic treatment.

P.M. Appearances :

- Cherry red colouration of the skin, mucous membranes, post mortum staining, blood, tissues and internal organs, which is usually associated with a COHb level >30% CO.
- Fine froth at the nostrils/mouth
- Blisters of skin over dependent areas or bony pressure points such as buttocks, calves, wrists and knees due to cutaneous oedema. Lungs may be oedematous.

Medico Legal Aspects :

- Suicide is rare with CO in India, anyhow a determined suicider may sit in his car and connect a tube from the exhaust to his nostril with doors closed.

- Accidental exposure occurs due to leakage from sources of domestic supply, lime burning, burning building etc
- Homicide is uncommon.

Carbon Dioxide: CO_2

- CO_2 is a heavy, colourless and odorless gas
- Atmospheric air contains 0.041% CO_2 , 21% Oxygen and 70-80% nitrogen.
- Slightly acidic in taste.

Sources :

It is formed during respiration and from combustion, fermentation and putrefaction of organic matter, mine explosion, manholes, ship holds, old wells etc.

Action :

Its mode of action is as an asphyxiant i.e it prevents the tissue from obtaining oxygen.

Signs and Symptoms :

Blood CO_2 (%) Signs and Symptoms

0-2%	No symptoms
2-5%	Increased respiration, throbbing headache
5-10%	Hyperpnea, tinnitus, mental confusion, muscular tremors.
10-20%	Slow respiration, fall in blood pressure.
20-40%	Dyspnea, muscular weakness, loss of reflexes
40-60%	Dyspnea, feeling of tightness in chest, tinnitus, muscular weakness, drowsiness, unconsciousness, coma and death
60-80%	Immediate unconsciousness, convulsions, death due to asphyxia (cerebral hypoxia)

- Solid CO_2 may cause burns following direct contact.

Fatal Concentration :

Concentrations > 10% may cause convulsions, coma and death

Fatal period : Instant collapse and death

Treatment :

- Immediate removal from the source
- Administration of oxygen and appropriate supportive care including assisted ventilation.
- Cardiac stimulants are useful.

P.M. Findings :

- Features of asphyxia- cyanosis, dilated pupils, marked capillary and venous congestion, petechial hemorrhages, froth at nostrils and mouth, blood is dark and fluid.

Medico Legal Aspects :

- Poisoning is mostly accidental in workmen associated with well sinking, well cleaning and descending in pits and shipholds.

Hydrogen Sulphide- H_2S

- Hydrogen sulphide is a colourless heavy, flammable transparent gas with smell of rotten eggs.
- It is formed during decomposition of organic substances containing sulphur.

Source :

- **Natural** : Caves, volcanoes, decaying fish, sewage (source gas), manure and putrefying cadaver.
- **Industrial** : Petroleum and tanning industry, silk, rayon and paper manufacturing processes.

Action :

- H_2S does not combine with hemoglobin, but does so with methemoglobin to form sulfmethemoglobin.
- It causes asphyxiation by interfering with the use of oxygen in the cytochrome oxidase system.

System	Signs and Symptoms
CNS	Headache, vertigo, nystagmus, weakness, coma
RS	Rhinitis, pneumonia, pulmonary oedema
CVS	Arrhythmia, myocardial depression.
Ocular	Lacrimation, photophobia, conjunctivitis

Chronic low level exposure may be associated with reduced lung function and neurophysiological abnormalities such as headache, depression and personality changes and chronic eye irritation.

Fatal Dose :

H_2S Concentration in Air (ppm)	Clinical Effects
> 200	Anosmia, pulmonary oedema
> 500	Hyperpnea, apnea.
> 1000	Respiratory paralysis, death

Exposure of > 700-800 ppm can cause immediate cardiopulmonary arrest.

Treatment :

- Remove the victim into fresh air.
- Artificial respiration and 100% O₂ is given.
- Antidote: Amyl nitrite and sodium nitrite (without thiosulfate) enhance the formation of methemoglobin which in turn is spontaneously detoxified in the body.
- Supportive measures: Correction of electrolyte imbalance and pulmonary oedema.

P.M. Findings

- Signs of asphyxia- like cyanosis, frothing at the mouth and nose and petechial haemorrhages in respiratory mucosa are seen.
- Rotten egg odour is present around the nostrils and mouth.
- Greenish discolouration of viscera, gray matter of the brain and bronchial secretions may be found.
- Pulmonary oedema and congestion of the viscera are seen.

Medico Legal Aspects :

- Poisoning is always accidental, causing number of deaths in sewer workers.

(C) Nonmetallic Poisons

Phosphorous

Phosphorous Exists in two Varieties :

1. White or crystalline - Samples of white phosphorus always contain some red phosphorus and therefore appear yellow (also called yellow phosphorus). Is used in fertilisers, insecticides, fireworks, bombs etc and is highly toxic.
2. Red or amorphous : Is non toxic

Action :

It is a protoplasmic poison and affects cellular oxidation. The metabolism of cells reduces, leading to necrobiosis which is predominantly seen in the liver.

Signs and Symptoms :

Contact Injury :

- White phosphorus exposure results in painful penetrating second and third degree burn injuries.
- The burn appears as a necrotic area with a yellowish colour and characteristic garlic like odour.

- White phosphorus is lipid soluble, and hence results in rapid dermal penetration and delayed wound healing.

Fulminating Poisoning :

- This is seen when more than one gram is ingested.
- These patients usually die within 12 hrs due to shock and cardiovascular collapse, because phosphorus has a direct action on the heart and blood vessels.
- Those who survive more than 12 hrs are restless, delirious and some maniacal before death. Death after 24 hrs is due to hepatic failure.

Acute Poisoning :

First Stage :

- It produces burning pain in the throat and abdomen with intense thirst, nausea, vomiting, diarrhea and abdominal pain.
- Breath, vomitus and feces have garlic like odour.
- Luminescent 'smoking' vomit and feces are diagnostic.
- A symptom free period lasting for 2-3 days is seen after the acute attack.

Second Stage :

Symptoms of systemic toxicity occur from absorbed poison.

System	Signs and Symptoms
GIT	Nausea, vomiting, hematemesis, diarrhea.
Hepatic	Tender hepatomegaly, jaundice, pruritis.
Renal	Oliguria, hematuria, casts, albuminuria, sometimes anuria.
CNS	Restlessness, anxiety, headache, confusion, hallucinations, convulsions, delirium, coma.
PNS	Paresthesia, tetany, laryngeal stridor, opisthotonus
Hematologic	Purpura, epistaxis, hemorrhage, in mucous membrane and viscera.

Fatal dose : 60-120 mg of white phosphorus.

Fatal period : 2-8 days.

Treatment :

- Life support measures - airway support and fluid maintenance should be provided.
- External burns should be washed and cleaned with mild disinfectant soap and water, antibiotic ointment applied.

- Gastric lavage using 1:5000 solution of KMnO_4
- Activated charcoal
- Demulcents
- Purgatives
- Vitamin K 20 mg IV in repeated doses.
- Transfusion of glucose-saline and plasma with vitamins to protect liver and correct shock and dehydration.

P.M. Appearances :

- Emaciation, purpuric hemorrhages in skin, jaundice,
- Smell of garlic may be present
- Mucous membrane of the mouth is corroded
- Hypostasis is dark brown in colour
- Multiple hemorrhages in muscles, serosal and mucosal membranes of gastro intestinal tract and respiratory tract, liver, kidneys, pericardium, peritoneum, lungs and brain.
- Mucous membranes of the stomach and intestines are yellowish or greyish white in colour, softened, inflamed and corroded in patches. Contents may have the smell of garlic.
- Liver is swollen, yellow, soft, fatty and easily ruptured.
- Kidneys are enlarged, greasy and yellow.

Medico-legal Aspects :

- Accidental poisoning in children due to chewing of fireworks or by eating rat paste.
- It is not preferred for suicide because of painful symptoms and prolonged suffering.
- May be used for homicide by mixing with alcohol or coffee.
- Rarely used as abortifacient.

Chronic Poisoning Symptoms :

- Frequent inhalation of fumes over a period of years causes necrosis of the lower jaw in the region of a decayed tooth.
- Initially there is toothache, followed by swelling of jaw, loosening of the teeth, and necrosis of the gums and sequestration of bone in the mandible with multiple sinuses discharging foul-smelling pus. This is known as '**Phossy jaw**' in which osteomyelitis and necrosis of the jaw occurs.
- Constitutional symptoms include nausea, vomiting, anorexia, pain abdomen,

indigestion, purging, pain in the joints, weakness, loss of weight, jaundice, ascitis and anemia.

Iodine

- Iodine occurs as bluish black, soft and scaly crystals and has a metallic lustre and an unpleasant taste.
- It gives off a violet coloured vapour which has a characteristic odour.

Signs and Symptoms :

- Inhalation produces glottic and pulmonary oedema
- When ingested, it acts as a corrosive poison
- Burning pain extending from mouth to stomach.
- Intense thirst
- Salivation
- Vomiting, purging
- Giddiness
- Cramps, convulsive movements of the limbs
- Fainting
- Lips and angles of the mouth are stained brown
- Vomited matter and excreta are dark yellow or blue in colour, contain blood and have peculiar odour of iodine.
- Urine is scanty or suppressed, red-brown in colour, contains albumin.
- Metabolic acidosis
- Nephritis
- Renal failure

Fatal dose : 2-4 gm

30-60 ml of tincture of Iodine

Fatal period : 24 hrs.

Treatment :

- Emesis
- Gastric lavage
- Antidotes- Sodium thiosulphate, Sodium chloride, Alkalies, Activated charcoal
- Symptomatic treatment

P.M. Appearances :

- Mucosa of stomach and intestines are inflamed.
- Heart, liver and kidneys show fatty degeneration
- Oedema of the brain

Chronic Poisoning : Iodism :

- Pain over the frontal sinus
- Running nose
- Conjunctivitis
- Bronchial catarrh
- Salivation, nausea, vomiting, purging
- Emaciation
- Lymphadenopathy
- Parotid swelling/Iodine mumps
- Wasting of breasts, testis etc
- Ioderma- erythematous patches on skin, urticaria etc.

Medico Legal Aspects :

- Poisoning from Iodine is very rare.
- Accidental cases of poisoning by drinking tincture of Iodine have occurred.
- Few suicidal cases are reported
- Cannot be used for homicide as it has a specific colour.

Metallic Poisoning**Arsenic**

- Metallic arsenic (black in colour) is not poisonous as it is not absorbed from the alimentary canal.
- When volatilised by heat, arsenic unites with oxygen and forms poisonous vapour of arsenic trioxide.
- Poisoning due to arsenic salts can occur due to ingestion, smoking with tobacco, injection, inhalation, absorption through ulcers or intact skin or through other natural orifices.

Poisonous Compounds :

1. Arsenious Oxide/Arsenic Trioxide As_2O_3 :

Sankhya or Somalkhar

- Is the most common form of arsenic used and is known as white arsenic/arsenic
- Most toxic form of arsenic
- Is a white, gritty, crystalline powder or in the form of a solid mass or cake.
- It may also be opaque with porcelain like appearance.
- It has no taste or smell and is sparingly soluble in water.
- It is used in fruit sprays, weed-killer, insecticides, rat poisons, calico-printing, wall papers, artificial flowers and as mordant in dyeing.

2. Copper Arsenite- (Scheele's green)- CuHAsO_3 :

and Copper Aceto-Arsenite (Paris Green or Emerald Green)

- These were extensively used for colouring artificial flowers, toys etc but not replaced by aniline dyes.
- Sometime used as insecticides for spraying on fruit trees.

3. Arsenic Acid : H_3AsO_4 :

- It is white, crystalline solid and is used in manufacturing aniline dyes.

4. Sodium and Potassium Arsenate : Na_3AsO_4 and K_3AsO_4 :

Used for homicidal purposes and to kill cattle.

5. Arsenic Sulphide :

Arsenic disulphide- Realgar Red arsenic Manashila - As_2S_2

Arsenic trisulphide- Orpiment- Yellow arsenic - Hartal As_2S_3 .

Both are used as pigments.

6. Arsenic Trichloride: AsCl_3 :

Is a highly poisonous, colourless, fuming liquid and causes severe irritation of the eyes and respiratory tract.

7. Arseniuretted Hydrogen : Arsine : AsH_3 :

Is a colourless, inflammable gas having a foetid garlicky odour. Industrial processes like galvanising, soldering, etching or lead plating can expose workers to fatal doses of this gas.

8. Organic Compounds of Arsenic :

Ex: Cacodylates, atoxyl, silver salvarsan, salvarsan etc.

Action :

- Arsenic interferes with cellular respiration by uncoupling mitochondrial oxidative

- phosphorylation by combining with sulphhydryl groups of mitochondrial enzymes, especially pyruvate dehydrogenase and certain phosphatases.
- Consequently conversion of pyruvate to acetyl CoA is decreased, citric acid cycle activity is decreased and production of cellular ATP is decreased.
- It inhibits cellular glucose uptake, gluconeogenesis, fatty acid oxidation and further production of acetyl CoA.
- Locally it causes irritation of the mucous membranes and remotely, depression of the nervous system.

Absorption :

- It is absorbed through the gastro intestinal tract, skin and lungs.
- It is present in almost all tissues and found in the greatest quantity in the liver followed by the kidneys and spleen.
- It is found in the muscles, bones, hair, nails and skin for years. Normally, the hair contains <2 PPM arsenic.

Excretion :

- It is excreted in the hair and nails within few hours of ingestion.
- It is also secreted into the stomach and intestines after absorption, even when given by routes other than mouth.

Signs and Symptoms

Acute Poisoning

- The signs and symptoms in acute poisoning usually manifest within 15-30 min after the dose, but may be delayed if taken with food.

System	Signs and Symptoms
GIT	Sweetish metallic taste in the mouth, nausea, persistent vomiting, burning in mouth and throat, difficulty in swallowing, garlic odour in the breath, intense thirst, pain in the oesophagus and abdomen, purging accompanied by tenesmus, pain and irritation around the anus. Initially, defecation is frequent and involuntary, dark-coloured and later it becomes colourless, odourless and watery resembling rice-water.
Renal	Oliguria, uremia, albuminuria, red cells and casts, pain during micturation,
CVS	Hypotension, pulmonary oedema ARAS, circulatory

System	Signs and Symptoms
	collapse, ventricular tachycardia and fibrillation.
Hepatic	Fatty infiltration
CNS	Headache, vertigo, hypothermia, tremors, convulsions, coma, general paralysis.
Skin	Loss of hair, skin eruptions.

Fulminant Type :

When large dose > 3 gm is taken, the gastro intestinal tract symptoms are absent and death occurs in 1-3 hr from shock and peripheral vascular failure.

Arsine Gas Exposure :

- Arsine gas exposure causes hemolysis, damages the liver, kidneys and depresses the CNS.
 - There is nausea, vomiting, shaking chills, backache and anemia.
 - Urine appears black due to hemoglobinuria
- Death may be preceded by anuria and convulsions.

Fatal Dose : 120-200 mg of arsenic trioxide

Fatal Period : 1-2 days

Differential Diagnosis :

1. Bacterial Food Poisoning :

The manifestations of vomiting and diarrhoea are delayed by 6-36 hrs in bacterial food poisoning while they occur within 15-30 min in arsenic poisoning.

2. Cholera :

Difference Between Arsenic Poisoning and Cholera :

S.N.	Features	Arsenic poisoning	Cholera
1.	Pain in throat	Before vomiting	After vomiting
2.	Sequence of vomiting and diarrhoea.	Purging follows vomiting	Vomiting follows purging
3.	Vomitous and blood	Contains mucus, bile or blood.	Watery, without
4.	Stool	Rice-watery, may contain blood	Rice-watery, no blood, passed in a

S.N.	Features	Arsenic Poisoning	Cholera
5.	Tenesmus and pain around anus	Present	continuous involuntary jet. Absent
6.	Voice	Not affected	Rough and whistling
7.	Conjunctiva	Inflamed	Not Inflamed
8.	Laboratory Investigation	Arsenic in chemical analysis	Vibrio cholerae present
9.	Circumstantial evidence	Of poisoning by arsenic in an individual/group of people/ family	Sporadic or epidemic form in the locality.
10.	Motive	Homicidal, rarely accidental	No such motive

Laboratory Investigations

Urine : excretion of $> 50 \mu\text{g/l}$ in 24 hr urine is indicative of poisoning.

Blood : Serum arsenic $> 0.9 \mu\text{g/dl}$

Hair : Arsenic $> 75 \mu\text{g}\%$

Nails : Arsenic $> 100 \mu\text{g}\%$

- Apart from the above, stool, liver, kidneys and bones show the presence of arsenic.
- Microcytic hypochromic anemia is common.
- Radio opaque sign on abdominal X-ray

Treatment :

- Repeated gastric lavage with large amount of warm water and milk. Activated charcoal is not recommended as it does not adsorb arsenic appreciably.

- Demulcents- like milk, butter or greasy substance

- Whole bowel irrigation

Antidotes :

Physical - Demulcents

Chemical - Freshly prepared hydrated ferric oxide

Pharmacological-

(a) BAL :3-5 mg/kg IM 4 hrly for 2 days, 6 hrly for 1 day and then 12 hrly for 10 days. BAL has 2 sulphhydryl radicals and hence it replaces arsenic. It forms BAL- arsenic complex which is excreted out by the kidney.

(b) Oral succimer (DMSA)-10 mg/kg every 8 hrly for 10 days.

(c) Dimerval (DMPS) - 200 mg IV 4 hrly

- Purgatives
- Glucose-saline to combat shock
- Hemodialysis or exchange transfusion.

P.M. Appearances :

- Body looks emaciated due to dehydration, rigor mortis appears early, putrefaction is delayed, eyeballs are sunken and skin cyanosed.
- The mucous membrane of the mouth, pharynx and oesophagus may show inflammation or ulceration, hemorrhages in abdominal organs and mesentery, larynx, trachea and lungs.
- Congested pulmonary oedema with subpleural ecchymoses, mucosa of the stomach is swollen, oedematous with large submucosal and subperitoneal hemorrhages giving the stomach a red-velvety appearance.
- There are large erosions, multiple ulcerations and sub-mucous petechial haemorrhages. There are haemorrhages on endocardium, larynx, trachea, lungs and abdominal organs.
- Degeneration of liver, heart and kidney.

Chronic Poisoning :

It results due to

- (a) After effect of acute poisoning
- (b) Consumption of repeated small doses
- (c) When used as medicine
- (d) Consuming food or drinks contaminated with arsenic.
- (e) In people working in industry using arsenic

Sings and Symptoms :

The signs and symptoms can be explained in 4 stages:

Stage I- Stage of Nutritional and Gastro Intestinal Disturbances-

Weakness, loss of weight, loss of appetite, abdominal pain, constipation, red and soft gums and increased temperature.

Stage-II- Stage of Catarrhal Changes:

Increased secretion from larynx, bronchi, hoarseness of voice, congested eyes, photophobia, running nose, cough with expectoration.

Stage III- Stage of Skin Rashes:

Brown, pin-point pigmentation of the skin known as rain drop appearance. Chronic ingestion causes vasodilatation and the milk and roses complexion. There may be falling out of the hair and brittleness of nails. White bands known as '**Mees lines**' crossing the nails of the fingers and toes, they indicate periods of arrested growth due to interference with normal metabolism.

Stage IV : Stage of CNS Disturbances:

- There is tingling and numbness of the hands and feet and tenderness of the muscles.
- Arsenical neuritis like that of chronic alcoholism
- Headache, drowsiness, impairment of vision and mental activity, neuritis, muscles atrophy, muscle paralysis.
- There may be liver damage, renal damage, bone marrow depression and heart involvement.

Treatment :

- Removal of patient from further exposure
- Dimercaprol (BAL)
- Vitamin B complex
- IV Sodium thiosulphate
- Symptomatic treatment

P.M. Appearances :

- Retardation of decomposition is evident
- Fatty degenerative changes in the heart muscles, liver and kidneys.
- Congestion of gastro intestinal tract
- Arsenic traces may be found in traces of hair and nails and at the end of long bones like femur.

Medico Legal Aspects :

- Arsenic is considered to be the best homicidal agent as it is easily available, cheap, has a small lethal dose, is tasteless, odourless. Symptoms in acute poisoning appear only in 1-1 1/2 hrs after ingestion giving sufficient time for the poisoner to escape and its symptoms mimics cholera.

- It was hence generally administered in betal leaf or paan, tobacco, tea, coffee or food.
- It has also been used as cattle poison.

Mercury/Quick Silver-Hg

Physical Characteristics :

- Mercury is a liquid metal with a bright silvery lustre.
 - As such metallic mercury is not poisonous if swallowed, as it is not absorbed.
 - If it is breathed or swallowed as vapour or if applied to the skin or mucous membrane in finely divided state, it is absorbed.
 - It forms two series of compounds
- A) Mercuric- Are soluble and therefore intensely poisonous
- B) Mercurous - Are less soluble and therefore less active.

(A) Mercuric Compounds :

1. Mercuric chloride : Hg Cl_2
2. Mercuric oxide : HgO
3. Mercuric Iodide : HgI_2
4. Mercuric cyanide : Hg (CN)_2
5. Mercuric sulphide : HgS
6. Mercuric sulphate : HgSO_4
7. Mercuric nitrate : $\text{Hg (NO}_3)_2$

(B) Mercurous :

1. Mercurous chloride : Hg_2Cl_2
2. Mercurous nitrate : $\text{Hg}_2(\text{NO}_3)_2$

Other organic compounds of mercury

Mode of Action :

- The mercuric ion binds with the sulphydryl groups of enzymes and cellular proteins, nucleic acids and mitotic apparatus interfering with enzyme and cellular transport functions.
- It is rapidly converted to mercuric ions in the blood which can lead to renal tubular damage.
- In the CNS, it acts mainly on cerebellum, temporal lobe, basal ganglia and corpus callosum.

Signs and Symptoms :

The signs and symptoms of acute poisoning by mercury can be explained in 2 phases.

(a) First Phase

- Acrid metallic taste in the mouth
- Constriction of the throat
- Hoarseness of the voice
- Difficulty in breathing
- Mouth and tongues become corroded, swollen and show a greyish white coating.
- Hot burning pain in the mouth extending down to the stomach and abdomen.
- Nausea and vomiting
- Diarrhoea with blood stained stools and tenesmus.
- Circulatory collapse
- Inhalation of fumes produces disorders related to the nervous system like ataxia, restriction of visual field, paresis and delirium.

Second Phase :

- If the patient survives the first phase, the second phase begins in about 3 days.
- Glossitis and ulcerative gingivitis appear within 24-36 hrs.
- Severe infection, loosening of teeth and necrosis of jaw.
- In 2-3 days, renal tubules show necrosis and produce transient polyuria, albuminuria, cylindruria, uraemia and acidosis.
- Recovery may occur in 10-14 days.
- Later membranous colitis develops producing dysentery, ulceration of colonic mucosa and haemorrhage, corrosion and necrosis, due to re-excretion of mercury.

Fatal Dose :

- Mercuric chloride - 1-2 gm
- Mercuric cyanide - 0.6-1.3 gm
- Mercuric nitrate : 4 gm

Fatal period : 3-5 days

Treatment :

1. Gastric lavage
2. Use of antidotes
 - a) Physical : Milk, egg-white, activated charcoal etc.
 - b) Chemical : 5% Sodium formaldehyde sulfoxylate 5% Sodium bicarbonate
 - c) Pharmacological :

i) Pencillamine : In less severe mercury vapour and inorganic mercury poisoning

Dose Oral :

Children : 100 mg/kg every 6 hrs x 5 days
Adult : 250 mg x 4 times a day x 5 days

ii) BAL :

1st day : 400 - 800 mg
2nd & 3rd day : 200 - 400 mg in divided dose every 4 hrs.
7-10 days : 100 - 200 mg in 2 divided doses.

BAL and Pencillamine in combination should not be used.

iii) Colonic lavage

iv) Haemodialysis if there is significant kidney damage.

P.M. Appearances :

- Mucosa of gastro intestinal tract shows inflammation, congestion, coagulation and corrosion.
- If patient survives for few days the large intestine shows necrosis due to re-excretion of mercury into the large bowel.
- Acute tubular and glomerular degeneration or haemorrhagic glomerular nephritis.
- Liver is congested and shows fatty changes.

Chronic Mercury Poisoning : Hydrargyris

Incidence

Chronic poisoning results from

1. Continuous accidental absorption by workers dealing with mercury in occupation as in the manufacture of thermometers, barometers, mirrors, ultraviolet apparatus or police officers engaged in finger print detection work where finger print powder contains mercury etc.
2. After effects of an acute attack.
3. Injudicious medical administration either internally or in external applications (ointments) for long time.

Signs and Symptoms

1. Excessive salivation, metallic taste in mouth and gastro intestinal tract disturbances, sore mouth and throat.
2. Gums : → Blue lines at junction of gums and teeth
→ Inflammation, ulceration and necrosis of the gums
→ Loosening of teeth

3. General debility, loss of weight, anaemia
4. Kidneys : Nephritis, Uraemia.
5. Tremors (**Danbury Tremors**) : Occurs first in hand, then in lips, tongue and finally involves arms and legs.
In advanced condition, it is called as **Hatter's Shakes** or Glass-blower's shake as it is common in people working in glass blowing and hat industries.
6. **Mercurial Erethism** : This phenomenon involves the psychological effects of mercury toxicity including anxiety, depression, shyness, timidity, irritability, loss of confidence, mental depression, delusions and hallucinations, emotional instability, loss of memory and insomnia.
7. **Mercurialentis** : Is a peculiar eye change due to exposure to the vapour of mercury, resulting in brownish discolouration of the eye lens capsule due to deposition of mercury through the cornea.
8. Skin changes/Pink disease/Acrodynia.
Is due to chronic mercury exposure usually in children. There is excessive sweating, skin rash, photophobia, hands and feet become puffy, pinkish, painful, paraesthetic with peeling of skin.

Treatment :

- Removal of patient from further exposure
- Demulcents
- Saline purgatives
- Oral hygiene
- Chelation therapy-

D-penicillamine : 25-40 mg/kg/day -for children and for adults 250 mg x 4 times/day given till urine mercury levels are $<5 \mu\text{L}$.

or

BAL : 100 mg IM /4 hrly x 2 days. -

100 mg/8 hrly x 8-10 days

or

DMSA 30 mg/kg/day, orally x 5 days

20 mg/day x 14 days

or

DMPS : 5 mg/kg IV or
6 infusion of 250 mg/day followed by
100 mg orally BD x 24 days

Medico Legal Aspects :

- Suicidal and homicidal poisoning is rare
- Sometimes used for criminal abortion
- Accidental poisoning may occur from ingestion of antiseptic solution containing mercury, mercury ointments, bleaching creams or the snake tablet (mercuric thiocyanate) a form of cracker used during Diwali.
- In case of mercury poisoning, the bones, teeth, hair and nails are preserved as additional viscera.

Lead - Pb

It is a heavy steel grey metal. Metallic lead and all its salts are poisonous.

Principal Salts of Lead :

1. Lead Acetate : $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$
2. Lead carbonate : PbCO_3
3. Lead Nitrate : $\text{Pb}(\text{NO}_3)_2$
4. Lead sulphate : PbSO_4
5. Lead chromate : PbCrO_4
6. Lead chloride : PbCl_2
7. Lead Iodide : PbI_2
8. Lead monoxide : PbO
9. Lead tetroxide : Pb_3O_4 : Sindur
10. Lead sulphide : PbS
11. Tetra - ethyl lead : Added to petrol

Mechanism of Action :

At the cellular level, lead interacts with sulphydryl groups and interferes with the action of enzymes necessary for haem synthesis and for haemoglobin and cytochrome production. It thus causes haemolysis of blood.

Signs and Symptoms :

Acute poisoning : Very rare. The manifestations resemble other metallic poisons except that diarrhoea is replaced by constipation and stools are black and foul smelling.

GIT : Sweet metallic, astringent taste in the mouth. Burning of the throat, vomiting of

white or bloody material, colicky pain in the abdomen which is relieved by pressure, the abdomen is tender, constipation.

Urinary: Oliguria, albuminuria, presence of lead in urine, red coloured urine.

CNS: Drowsiness, insomnia, headache, muscular cramps, convulsions, rarely paralysis.

Subacute Poisoning :

It results from consumption of repeated doses of soluble salts of lead. The manifestations include:

- Blue lines on the gums
- Face looks pale and anxious
- Decreased secretions
- Gastro Intestinal Tract, CNS and urinary manifestations as in acute poisoning and are more pronounced.

Fatal Dose :

Lead acetate : 20 gms

Lead carbonate : 45 gms

Lead tetra ethyl : 1-2 drops

Fatal period : 1-2 days

Treatment :

- Gastric lavage
- Antidotes-

Physical : Demulcents

Chemical : Sodium or magnesium sulphate

Pharmacological :

(a) EDTA

(b) Calcium disodium ethylene diamine given in drip method

§ Pencillamine

- Morphine and atropine for pain abdomen
- Vitamine B6, Vit. D and Vit. C
- Calcium chloride, calcium rich diet is recommended.

P.M. Appearances :

- Gastric mucosa is congested, sometimes eroded.
- Stools are black

- Features of gastro enteritis

Chronic Lead Poisoning / Plumbism, Saturnism :

Incidence:

- Occurs in people working in factories and industries using lead and involving inhalation of dust as in paint industry, plumbing, glass-blowers, electric wire industries, batteries, toys, hair-dye and gasoline.
- Food contaminated with lead (stored or cooked in tins)
- Water stored in lead vessels.
- Vermillion (sindur) used by ladies.
- Lead-tetraoxide used on idols of gods.
- Children can be poisoned through chewing and licking of toys pasted with lead based paints.
- Lead vapour is more dangerous than dust.

Sign and Symptoms :

1. Facial Pallor: Palloriness in face specially about the mouth.

2. Anaemia: Anaemia associated with polychromasia, punctate basophilia, reticulocytosis, poikilocytosis, anisocytosis are seen.

3. Colic and Constipation/Dry Belly Ache: Affects intestines, uterus, ureters and blood vessels. Colic is intermittent, spasmodic and relieved by pressure and is associated with constipation.

4. Cardio-Renal Manifestations:

Cardiac: Increased B.P., arterio-sclerotic changes.

Renal: Presence of albumin, lead etc in urine, Nephritis.

5. Lead Line: A stippled blue line called as Burtonian line is seen on gums, specially on upper jaw, due to subepithelial deposit of granules at the junction with teeth.

6. Lead Palsy:

- Usually occurs late
- There may be tremors, numbness, hyperaesthesia and cramps before actual muscle weakness.
- Wrist and foot drop is noticed when the radial nerve along with intrinsic muscles of hand/foot are affected.
- Paralysis is associated with degeneration of nerve and atrophy of the muscles.

7. Lead Encephalopathy :

- Usually seen in children. Symptoms include vomiting, headache, insomnia, visual disturbances, irritability, restlessness, delirium, hallucinations, convulsions, coma and death.
- Lead encephalopathy is usually irreversible and about 85% have permanent brain damage.

8. Reproductive System :

- Amenorrhoea, Dysmenorrhoea, menorrhagia, sterility of both sexes, abortion etc noticed.

9. General Manifestations :

- Weakness, anorexia, foul-breath, dyspepsia, irritability and pain in joints, loss of hair etc is noticed.

Medico-legal Aspects :

- Acute poisoning is very rare.
- Chronic poisoning is more common.
- Suicide or homicide is rare.
- Sometimes lead oleate is used locally for criminal abortion.
- May be used as cattle poison.

Copper - Cu

Copper as a metal is not poisonous. Anyhow, the poisonous compounds of copper include

1. Copper sulphate/Blue vitriol : $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
2. Copper carbonate : $\text{Cu}_2(\text{OH})_2\text{CO}_3$
3. Copper subacetate : $2\text{Cu}_3(\text{OH})_4(\text{C}_2\text{H}_3\text{O}_2)_4$

Mechanism of Action :

- Copper also acts on sulphydryl group of enzyme.
- It precipitates proteins

Signs and Symptoms :

- Metallic taste, increased salivation
- Burning pain in stomach, colicky abdominal pain, thirst, nausea, eructations, repeated vomiting, vomited material being blue or green.
- Diarrhoea with brown coloured stool but not bloody.

- Oliguria, haematuria, albuminuria, acidosis and uraemia may occur.
- In severe haemolysis, haemoglobinuria, methaemo-globinaemia, jaundice, pancreatitis, cramps of legs, convulsions, etc occur.
- Death due to shock.
- Acute Inhalation : Acute Inhalation of large doses of copper dusts or fumes can cause upper respiratory irritation resulting in sore throat and cough, conjunctivitis, palpebral oedema, sinus irritation, atrophy and perforation of nasal mucous membranes etc may be associated.
- Skin exposure : Irritant contact dermatitis. Severe exposure may result in greenish blue discolouration of the skin.

Fatal Dose :

Copper sulphate : 30 gm

Copper subacetate : 15 gm

Fatal period : 1-3 days

Treatment :

- Gastric lavage
- Diuretics
- I.V. fluids
- Emetics are contraindicated as copper salts are emetics by themselves.
- Antidotes :

Physical : Demulscents

Chemical : Potassium ferrocyanide (which forms insoluble cupric ferrocyanide)

Pharmacological : Pencillamine/BAL/EDTA

P.M. Appearances :

- Skin may be yellow
- Greenish blue froth may be present at mouth and nostrils.
- Stomach contents are greenish or bluish
- Gastric mucosa may be inflamed or corroded.
- Degeneration of liver and kidneys in chronic poisoning

Chronic Poisoning :

- May occur in workers with metal due to inhalation of dust or from food being contaminated with cupric acetate (Verdigris).

Signs and Symptoms :

- Gradual anaemia
- Green line on gums
- Nausea, vomiting
- Colic, diarrhoea
- Peripheral neuritis
- Degeneration, atrophy of muscles
- Body secretion are greenish
- Conjunctivitis, corneal ulceration
- Laryngitis, bronchitis
- Nephrotoxicity
- Presence of copper deposits in tissues - Chalcosis.
- Corneal deposition resulting in a pigmented ring in the deeper layers.
- Chronic contact with swimming pool water containing copper chemicals can cause green hair discolouration.

Medico Legal Aspects :

- Suicidal and homicidal poisoning is rare.
- Sometimes used as abortifacient and as cattle poison.
- Accidental poisoning results from eating food contaminated with verdigris which is formed from the action of vegetable acids on copper cooking vessels which are not properly tinned on the inside or taken along with vegetables which are sprayed with copper containing chemicals to retain their green colour.

Tin (Sn)**Toxic Salts of Tin :**

- Stannous chloride
- Stannic chloride
- They occur as whitish yellow crystals, usually seen as acid watery solution.
- Mixture of stannous and stannic chlorides in a solution- Dyers spirit, used as a mordant in calico-printing.

Signs and Symptoms :

- Metallic taste in the mouth
- Nausea

- Vomiting
- Pain abdomen
- Purging
- Feeble irregular pulse
- Cyanosis, headache
- Depression
- Collapse, unconsciousness or drowsiness

Fatal dose : Unknown

Fatal period : Unknown

Treatment :

- Emesis
- Gastric lavage

Antidotes :

Physical : Demulcents, eggs.

Chemical : Potassium iodide.

P.M. Appearances :

Symptoms of gastro-enteritis are evident.

Medico Legal Aspects :

- Poisoning by tin is very rare.
- Accidental cases occur from use of tinned fruits or wearing silk clothing which are sometimes impregnated with tin chloride.

Zinc - Zn

Zinc is a bluish white lustrous metal.

Important Toxic Salts of Zinc :

1. Zinc chloride : ZnCl_2 : Butter of Zinc - Corrosive
2. Zinc sulphate : $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$: White vitriol- Irritant
3. Zinc phosphide : Zn_3P_2 - Rodenticide
4. Zinc Oxide : ZnO .

Signs and Symptoms :

Zinc sulphate is mainly gastro intestinal tract irritant and causes-

- Metallic taste in mouth.
- Pain in stomach and abdomen

- Vomiting, diarrhoea
- Collapse
- Zinc chloride has corrosive action and causes-
 - Destruction of mucous membrane of the mouth, throat, oesophagus and stomach.
 - Severe vomiting
 - Purging with tenesmus and blood.
 - Symptoms of shock
- Zinc phosphide is an effective economic rodenticide. If ingested, as it comes in contact with the gastric acid, it releases highly toxic phosphine gas. It causes.
 - Metallic taste in the mouth
 - Burning in the throat, oesophagus, stomach.
 - Nausea, vomiting, diarrhoea, abdominal pain.
 - Patient complains of garlic taste in the mouth, garlicky odour may be perceived in the breath.
 - G. I. T. disturbances
 - Evidence of liver damage, haemorrhages in the skin.
 - Liberated phosphine gas causes dyspnoea, pulmonary oedema, bradycardia, circulatory collapse or neurological symptoms, coma and death.
 - Shock, oliguria, acidosis, tetany and convulsions may be seen.

Fatal dose:

Zinc sulphate : 15 gms

Zinc chloride : 400 mg

Zinc phosphide : 5 gms.

Fatal period: Few hrs - 24 hrs.

Treatment :

- Gastric lavage
- Demulcents
- Symptomatic Treatment-
 - In case of zinc phosphide- If skin/clothes are contaminated, it should be removed and affected parts washed thoroughly with soap and water.
 - Emesis
 - Gastric lavage with 5% sodium bicarbonate which minimises conversion of phosphide to phosphine.

- Supportive measures.

P.M. Appearance :

- Similar to other Irritants/Corrosives
- In Zinc phosphide - garlic odour of the stomach is specific.
- Congestion of liver, spleen, kidney, brain and lungs

Medico Legal Aspects :

- Chloride and sulphates are reported to be used both as suicidal and homicidal poison.
- Known to be used for criminal abortion.
- Accidental poisoning of specially zinc phosphide is common in farmers.

Chronic Poisoning :

- Chronic poisoning occurs among zinc smelters, welders and cutters who inhale the fumes.

Signs and Symptoms :

- Rigors
- Respiratory irritation
- Cyanosis
- Metal fumes fever
- Digestive disturbances
- Dyspepsia
- Colic with constipation
- Anaemia
- Peripheral neuritis leading to paralysis.

(D) Others**Petroleum****Rock Oil :**

- Petroleum contains gas and liquid constituents
- It is an oily liquid found under the ground in several parts of the earth.
- The refined oil is known as kerosene.
- The other products which are separated during the process of purification are classified into 2 groups according to their boiling point in relation to kerosene.
- Those which are lighter and boil at a lower temperature than kerosene are known as gasoline.

- Ex: Ether, pentane, Hexane, octane, petrol, naptha, benzine etc.
- Those which are heavier and boil at higher temperature than kerosene - Lubricating oils.
- Ex: Vaseline, paraffin.
- Toxicity of petroleum distillates are inversely proportional to the boiling point.
- Vaseline, paraffin- non toxic- used as medicine.
- Ether, petrol, naptha etc. - highly toxic if swallowed or inhaled.

Signs and Symptoms:

Skin :

- Acute/chronic contact causes chronic eczematoid dermatitis with redness, itching and inflammation.
- Cutaneous exposure to gasoline and other hydrocarbons can cause second degree burns and systemic manifestations.

Pulmonary :

- Gasping, coughing and choking indicate aspiration.
- Nasal flaring, intercostal retractions, dyspnoea etc.

CNS :

- Depression of CNS noticed.
- Somnolence, dizziness, convulsions and coma

Eye :

- Photophobia, redness and transient corneal irritation.

Chronic Exposure :

- Benzene is considered a human carcinogen.
- Aplastic anaemia, myelocytic and monocytic leukaemia have been reported.

Fatal dose: 15-20 ml benzene

Fatal period: Within one day

Treatment :

1. Removal of contaminated clothing.
2. Wash the affected areas of skin with soap and water
3. In ocular exposure-prolonged irrigation with sterile solution.
4. Gastric lavage may be indicated for some products like benzene, methylene chloride etc. Lavage for pure petroleum distillate/turpentine ingestion is contraindicated.

5. Activated charcoal has limited value.
6. Symptomatic treatment

P.M. Appearance :

- Signs of asphyxia are present.
- There may be acute gastroenteritis and odour may be present in the lungs and alimentary canal.
- Petechial haemorrhages in trachea etc.
- Fatty degeneration of liver and kidney.

Medico-legal Aspects :

- Poisoning is usually accidental, especially in children.
- Adults may mistake it for country liquor.
- Suicidal poisoning is rare.
- Not used for homicide.

Kerosene

Signs and Symptoms :

- There is a kerosene taste
- A sensation of burning in the throat
- Nausea, vomiting
- Colicky pain and diarrhoea
- Breath, vomit and urine smell of kerosene
- Respirations become slow and shallow
- Cyanosis develops
- Lung complications like bronchopneumonia and pulmonary oedema are common.
- CNS depression results in giddiness, weakness and drowsiness followed by coma and death from respiratory failure.

Inhalation :

- Inhalation of fumes cause headache, vertigo, nausea, vomiting and lung complications
- Intense excitement, hallucinations and convulsions.
- In fatal cases, cyanosis, unconsciousness and coma precede death.

Chronic Poisoning:

- It is known to occur from inhalation in persons who handle petroleum products.

- Dizziness, weakness, weight loss, anaemia, nervousness, pain in limbs, peripheral numbness and paraesthesias.

Fatal dose : Ingestion of > 10 ml of kerosene may be fatal

Fatal period: Few hours.

Treatment :

1. Stomach wash- with 5% sodium bicarbonate
2. 250 ml of liquid paraffin orally
3. Saline cathartic

In case the poison is inhaled- remove the patient to open air, provide artificial respiration if required and symptomatic treatment.

P.M. Appearance :

- Acute gastroenteritis may be seen.
- Kerosene odour in contents of stomach and lungs
- Pulmonary oedema and bronchopneumonia.
- Degenerative changes in the liver and kidneys.
- Signs of asphyxia.

Medico-legal Aspects :

- Kerosene is occasionally used for self immolation
- Homicidal attempts by pouring kerosene on clothes and igniting them are common in dowry death in India.
- Accidental poisoning is also common.

Organo Phosphorus Compounds

- Organophosphorus compounds are used as pesticides and come under the category of agricultural poisons.
- They are esters of phosphoric acid and form two series of compounds.

(a) Alkyl Phosphates:

Ex: HETP, TEPP, OMPA, Trichlorfon, Malathion etc.

(b) Aryl Phosphate:

Ex: Parathion, methyl parathion, diazinon etc.

Mechanism of Action:

- O.P. compounds are powerful inhibitors of carboxylic esterase enzymes, including acetyl cholinesterase.

- They bind firmly to the esterase enzyme, inactivating it by phosphorylation at the myoneural junctions and synapses of the ganglions, in all parts of the body.
- Hence acetylcholine accumulates at the parasympathetic, sympathetic and somatic sites thus preventing the transfer of nerve impulses across synapses at the autonomic ganglia at the nerve-muscle junction.

Signs and Symptoms :

- They have three distinct toxic actions.

1. Muscarine Like Effects :

It potentiates the postganglionic parasympathetic activity.

- a) Bronchial tree: Bronchospasm, increased secretions, causes dyspnoea, chest pain, cough, cyanosis and pulmonary oedema.
- b) GIT- Anorexia, nausea, vomiting, abdominal cramps, pain, diarrhoea, tenesmus and involuntary defecation.
- c) Sweat glands - Increased sweating
- d) Salivary glands - Increased salivation
- e) Lacrimal glands - Increased tears, may be red due to porphyrin.
- f) Heart- Bradycardia
- g) Pupils- Meiosis, blurring of vision.
- h) Urinary bladder - frequency of micturation, involuntary micturation.

2) Nicotine Like Effects :

- Stimulation of preganglionic - sympathetic fibres followed by paralysis.
- Initially twitchings of the eyelids, tongue and facial muscles.
- Later arrhythmias, paralysis of sphincters, neuro-muscular block and paralysis.

3) C.N.S. Stimulation Followed by Depression :

- Restlessness, emotional lability, headache, tremors, anxiety, drowsiness, confusion, slurred speech, ataxia, generalised weakness, coma, convulsions, depression of the respiratory and cardiovascular centres.

Causes of Death :

- Asphyxia due to paralysis of respiratory muscles.
- Cardiac arrest
- Pulmonary oedema
- Cerebral oedema

Fatal Dose :

- Varies between 25 mg to 1 gm
- TEPP : 50 mg IM
100 mg oral
- OMPA : 80 mg IM
175 mg oral
- Parathion : 80 mg IM
25 - 175 mg oral
- HETP : 60 mg IM
350 mg oral
- Malathion and diazinon : 1 gm oral

Fatal period: 24 hrs in untreated cases.

Treatment :**1. Decontamination :**

- Patient is removed from the source
 - Remove the clothes
 - Wash skin and mucous membrane with soap and water
 - Gastric lavage
 - Emetics
2. Artificial respiration if required
 3. Antidote

Atropine: It blocks the muscarinic effects and arrests CNS effects, anyhow has no effect on nicotinic actions.

Dose: Initially 2-4mg/4-6mg (depending on severity) IV or IM

- Repeat 2-4mg IV/IM at 3-10 min interval till signs of atropinization in the form of dry skin, dry mouth, dilated pupils, tachycardia and warmth appear.

4. Cholinesterase reactivators

- Oxime compounds are used, ex: Diacetylmonoxime (DAM), pralidoxime (Pralidoxime chloride) given 1-2gm IV as 5% solution, may be repeated 12-24 hrly.

5. Symptomatic treatment**P.M. Appearance :**

- Suggestive of asphyxia.

- Cyanosed face
- Oronasal blood stained froth
- Stomach has blood stained contents with garlicky smell.
- Pulmonary and cerebral oedema.
- Petechial haemorrhages and hyperaemia of lungs, brain and other viscera.

M.L. Aspects :

- Readily used for suicide, homicide and cattle poisoning
- Accidental poisoning is very common.
- Since it is deposited in the body fat, it may be released into the body at a later stage leading to delayed death.

Aluminium Phosphide - ALP

Physical Characteristic :

- Aluminium phosphide is a solid fumigant pesticide, insecticide and rodenticide.
- In India it is available as white tablets of celphos, alphos, phosphotex etc, each weighing 3gm and has the capacity to liberate one gram of phosphine (Ph_3), which is a systemic poison and affects all organs of the body.
- ALP has a garlicky odour.
- It is widely used as grain preservative and are left in the grain.

Absorption :

- Phosphine is rapidly absorbed from GI tract and causes damage to the internal organs.
- It is also rapidly absorbed from the lungs after inhalation.
- It is metabolised in the liver.

Mechanism of Action :

- Phosphine inhibits the respiratory chain enzymes and has cytotoxic action.

Fatal dose: • 1 tablet

- Inhalation of phosphine at 400-600 ppm concentration.

Fatal period: 1 hr to 4 days

Signs and Symptoms :

Inhalation-

Mild toxicity :

Dizziness, easy fatigue, lightness in the chest, nausea, vomiting, diarrhoea, and headache.

Moderate Toxicity :

Ataxia, numbness, paraesthesia, tremors, diplopia, jaundice, muscular weakness, incoordination and paralysis.

Severe Toxicity :

Adult respiratory distress syndrome, cardiac arrhythmias, congestive heart failure, pulmonary oedema, convulsions and coma.

Ingestion :

GIT	:	Nausea, vomiting, diarrhoea, retrosternal pain.
CVS	:	Hypotension, shock, arrhythmias, acute congestive heart failure.
R.S.	:	Cough, dyspnoea, cyanosis, pulmonary oedema, respiratory failure.
Hepatic	:	Jaundice, hepatitis, hepatomegaly.
Renal	:	Renal failure
CNS.	:	Headache, dizziness, altered mental state, restlessness etc.

P.M. Appearances :

- Garlic like odour at mouth and nostrils and in gastric contents.
- Blood stained froth in mouth and nostrils.
- Lungs, liver, brain, kidneys are congested

Treatment :

- Gastric lavage with KMnO_4
- Activated charcoal 100gm orally to adsorb phosphine.
- Liquid paraffin - for excretion of ALP.
- Antacids
- Magnesium sulphate reduces organ toxicity.
- Treatment of shock

Medico Legal Aspects :

- Suicidal poisoning is very common as it is readily available agricultural poison.
- Homicidal, commonly in form of dowry deaths.
- Occasionally accidental

Organo-chlorinated Compounds

- The organo-chlorinated compounds can be divided into four categories.
 1. DDT and analogues - Ex: DDT, methoxychlor

2. Benzene hexachloride: ex: Lindane
3. Cyclodienes: Ex: Aldrin, chlordane, endosulfan, endrin etc.
4. Toxaphene and related compounds.

• Among the above said categories, endrin is the most toxic and its poisoning is common.

Endrin :

- It is a polycyclic, polychlorinated hydrocarbon.
- It is not soluble in water, tastes bitter and is called as "plant penicillin" because of its broad spectrum of activity against various insect pests.
- It is sold in the market as Endrin- we 16, Endox DB-50, Endtox EC-20, Tafdrin etc and chiefly used against insect pests of cotton, paddy, sugarcane and tobacco.

Signs and Symptoms :

- Toxic effects follow ingestion, inhalation or skin contamination.
- Salivation, nausea, vomiting, abdominal pain, diarrhoea.
- Hoarseness of voice, coughing, froth at mouth and nose, dyspnoea, headache, giddiness, restlessness.
- Hyperirritability, dilated pupils, incoordination, ataxia, mental confusion, tremors, tonic and clonic convulsions, coma and death due to respiratory failure.

Chronic Poisoning :

- Long term exposure to some of these compounds results in cumulative toxicity characterised by loss of weight, weakness, ataxia, tremors, mental changes, oligospermia and increased tendency to leukaemias, purpura, aplastic anaemia and liver cancer.

Fatal Dose: 5-6 gms

Fatal period: 1 hr to several hours.

Treatment :

1. Decontamination
2. Gastric lavage/Emesis
3. Activated charcoal
4. Cholestyramine - 16 gm/day in divided doses for several days.
5. Maintenance of adequate airway and circulation
6. Calcium-10ml of 10% solution IV every 4-6 hrs.
7. Control of convulsions with diazepam and phenobarbital.

P.M. Appearances :

- These are suggestive of asphyxia.
- Mouth and stomach contents have kerosene like smell.
- Liver, kidney, brain congested.
- Endrin resists putrefaction and can be detected for long time after death.

Medico-legal Aspects :

- Occupational or accidental exposure is common.
- Suicidal deaths by consumption of endrin is very common.
- Homicide rare, but may be given by mixing in food or sweets or alcohol.

Household Poisons

The common household poisons are described in the table below.

Preparation	Toxic Substance
Domestic Poison-Cosmetics	
1. Cuticle remover	Potassium hydroxide trisodium phosphate
2. Hair wave lotions	Thioglycollate salts, Perborates, Bromates
3. Nail polish removers	Acetone
4. Suntan lotions	Denatured alcohol, Methyl salicylate
5. Baby powder	Boric acid
Domestic Poisons-Kitchen	
1. Baking powder	Tartaric acid 50%
2. Baking soda	Sodium bicarbonate
3. Dish washing compounds	Sodium polyphosphates, Sodium carbonate, Sodium silicates
4. Match stick	Antimony, Phosphorus, Potassium chlorate
Domestic Poisons-Rat Poisons	
1. Rat paste	Aluminium phosphide
	Zinc sulphide
	Zinc phosphide
	Arsenious oxide etc
2. Rodine	Yellow phosphorus
Domestic Poisons-Sanitary	
1. Deodorant tablets	Formaldehyde

Preparation

2. Drain cleaner
3. Disinfectants

Toxic Substance

Naphthalene
Sodium hydroxide
Phenol
Bleaching powder

Domestic Poison-Miscellaneous

1. Insecticide spray
2. Moth balls
3. Cleaning solvents

DDT
Gammexane etc
Naphthalene
Petroleum hydrocarbons
Carbon tetrachloride
Trichloroethylene

4. Furniture polish

Turpentine
Petroleum hydrocarbons

5. Shoe polish

Aniline
Nitrobenzene

6. Hair bleach

Potassium permanganate
Hydrogen peroxide

7. Toys (Paints)

Lead

8. Fireworks

Arsenic
Mercury
Antimony
Lead

Phosphorus etc

9. Crayons (wax)

Para-nitroaniline

Garden Poisons

1. Insecticides

Organophosphorus compounds
Chlorinated hydrocarbons
Nicotine
Tar oils.

2. Fungicides

Lead arsenate
Copper compounds

Preparation**Toxic Substance****Organic Mercurials**

3. Weed killers

Sodium chlorate

Arsenious oxide

Arsenites

Paraquat

Therapeutic Poisons

1. Antiseptics

Iodine

Benzoin

2. Sleeping tablets

Barbiturates

3. Analgesics

Aspirin

4. Cough remedies

Codeine

5. Others

Antidepressants

Tranquilisers etc.

Important Questions**Short Essay:**

1. Sulphuric acid poisoning.
2. Oxalic acid poisoning.
3. Mercuric poisoning.
4. Arsenic poisoning.
5. Plumbism.
6. Copper poisoning.
7. Organo phosphorous poisoning.

Short Answers:

1. Vitriolage.
2. Phossy jaw.
3. Asphyxiants.
4. House hold poisons.
5. Aluminium phosphide poisoning.

Madya and Madatyaya

माध्यति जनोनेन इति मद्य।

- The substance which makes a person to loose his sense following its consumption is called as madya.

बुद्धि लुप्यति यदि द्रव्यं मदकारि तदुच्यते। तमो गुण प्रधानं च यथा मद्य सुरादिकम्।। (शा.सं.प्र. ४-२२)

- Substances which cause derangement of the intellect and possess tamo guna predominantly, like madya or sura, are considered as madakari.
- माद्यत्यनेन करणे यत् - The word 'मद्य' is derived from 'मद्' + 'यत्' - that which produces a state of mada is termed as madya.

Properties of Madya :

लघु उष्ण तीक्ष्ण सूक्ष्म अम्ल व्यवायी आशुगमेवच।

रूक्षं विकासि विशदं मद्यं दशगुणं स्मृतम्।। (च.चि. २४/३०)

- Laghu, ushna, teekshna, sookshma, amla, vyavayi, aashu, rooksha, vikasi and vishada are the 10 gunas of Madya.
- The gunas of madya are similar to those of visha and opposite to that of ojus.
- Anyhow, the teekshnadi gunas are in extreme intensity in visha and are milder in madya.
- Therefore madya produces only disorders of mind and body¹.

Merits of Madya :

बहुद्रव्यं बहुगुणं बहुकर्म मदात्मकम्। गुणैः दोषैश्च तन्मद्यम् उभयुचोपलक्ष्यते।। (च.चि. २४/२६)

- Madya is made of multiple ingredients possessing many properties and actions and it is intoxicating in nature. It is featured by both merits and demerits.
- If taken in an appropriate manner, in a right dose, at an appropriate time, along with wholesome food, in accordance with ones own strength and with a cheerful mind, alcohol works like amrita.²
- Madya taken in appropriate manner produces exhilaration, energy, happiness,

१. तीक्ष्णादयो विषेऽप्युक्ताश्चित्तोपप्लाविनोगुणाः। जीवितान्ताय जायन्ते विषे तूत्कर्षवृत्तिः।। (अ.सं.नि. ६/३)

२. विधिना मात्रया काले हितैरन्नैर्यथाबलम्। प्रहृष्टोयः पिबेन्मद्यं तस्य स्यादमृतं यथा।। (च.चि. २४/२७)

nourishment, good health, excellent virility and pleasant intoxication.¹

- Madyapana promotes appetite, stimulates the power of digestion, tones up the heart, promotes the voice and complexion, produces the feeling of refreshment and corpulence, increases strength and removes fear, grief and fatigue.²
- Patients suffering from insomnia enjoy sound sleep by taking madya and it stimulates speech in timid persons.³
- It helps persons having excessive sleep to remain awake and causes bowel movement in constipated patients.⁴
- It renders the mind insensitive to the miseries of injury, imprisonment and fatigue.⁵
- Madya itself cures the disease caused by its excessive and inappropriate intake.⁶
- It represents erotic passion and when associated with an object, it promotes the association of pleasure in it.⁷
- It stimulates passion and amusement even in old age.⁸
- It provides relief to persons afflicted with infinite sufferings and grief.⁹

Demerits of Madya :

- The person addicted to madyapana does not differentiate between the right and the wrong, happiness and unhappiness, good and bad, suitable and unsuitable, he does not even know how to behave and take the madya.¹⁰
- By continuous intake of madya, mind gets afflicted by its adverse effect and become deprived of the sattvika qualities. These people, with a craving for intoxication, become blinded by madya and lose all happiness of life.
- Illusion, fear, grief, anger and death and diseases like insanity, intoxication, fainting, epilepsy and apatanaka are caused by madya.¹¹

... .. निहन्येव ओजसः स्वगुणैर्गुणान्। सत्त्वं तदाश्रयं चाशु संक्षोभ्य जनयेन्मदम्॥ (च.चि. २४/३४)

१. हर्षऊर्जमुदपुष्टिमरोग्यं पौरुषं परम्। युक्त्या पीतं करोत्याशु मद्यं सुखमदप्रदम्॥ (च.चि. २४/६१)

२. रोचनं दीपनं हृद्यं स्वरवर्णप्रसादनम्। प्रीणनं बृंहणं बल्यं भयशोकश्रमापहम्॥ (च.चि. २४/७२)

३. स्वापनं नष्टनिद्राणामूकानां वाग्विबोधनम्। (च.चि. २४/६३)

४. बोधनं चातिनिद्राणां विबुद्धानां विबन्धनुत्॥ (च.चि. २४/६३)

५. वधबन्धपरिक्लेशदुःखानां चाप्यबोधनम्।

६. मद्योत्थानां च रोगाणामद्यमेव प्रबोधकम्॥

७. रतिविषयसंयोगे प्रीतिसंयोगवर्धनम्।

८. अपि प्रवयसां मद्यमुत्सवामोदकारकम्॥

९. बहुदुःखहतस्यास्य शोकेनोपहतस्य च। विश्रामो जीवलोकस्य मद्यं युक्त्या निषेवितम्॥ (च.चि. २४/६४-७)

१०. धर्माधर्मसुखदुःखमर्थानर्थहिताहितम्। यदाऽसक्तो न जानाति कथं तच्छीललयेद्बुधः॥ (अ.सं.नि. ६/९)

११. मद्योपहतविज्ञानवियुक्ताः सात्त्विकैर्गुणैः। श्रेयोभिर्विप्रयुज्यन्ते मदान्धामदलालसाः॥

मद्योमोहोभयं शोकः क्रोधो मृत्युश्च संश्रितः। सोन्मादमदमूर्च्छायाः सापस्मार अपतानकाः॥ (च.चि. २३/५५-५६)

- Madya destroys all the attributes of ojas which is the abode of satva, by virtue of its ten attributes and as a result of this affliction, the mind gets agitated and so causes intoxication.
- Heart is the abode of the channels of circulation of rasa, vata etc, the sattva, buddhi, indriyas, atman and ojas which is the most important one. This ojas gets destroyed by the excess intake of alcohol and morbidities appear in the heart and in the dhatus located in it.¹

Mada :

'Mada' is the condition or state of being intoxicated, especially by overindulgence of madya.

Stages of Mada :

Intake of madya results in three stages of intoxication.²

१. प्रथमावस्था (First Stage) :

- During the first stage, the ojas is not afflicted.
- Heart gets stimulated.³

Following Symptoms are Seen⁴:

- | | | |
|---|---|--|
| • प्रहर्षणः | - | excitement |
| • प्रीतिकर | - | passion |
| • पानान्न गुण दर्शक | - | interest in the qualities of food and drinks. |
| • वाद्यगीत प्रहासानां कथानां च प्रवर्तक | - | creativity of music, song, humour and stories |
| • न च बुद्धि स्मृतिहरो | - | Does not impair wisdom and memory |
| • विषयेषु न चाक्षमः | - | Does not cause inability for senses to perceive their objects. |
| • सुख निद्रा प्रबोध | - | Results in sound sleep. |

२. द्वितीय अवस्था (Second Stage) :

- During the second stage, ojas is mildly afflicted⁵.
- The following signs and symptoms are noticed

१. रस वातादिमार्गाणां सत्त्वबुद्धीन्द्रियात्मनाम्। प्रधानस्यौजसश्चैव हृदयस्थानमुच्यते॥
अतिपीतेन मद्येन विहतेनौजसा च तत्। हृदयं याति विकृतिं तत्र स्थाये च धातवः॥ (च.चि. २३/३४-३६)
२. पीयमानस्य मद्यस्य विज्ञानव्यास्रयो मदाः। प्रथमो मध्यमोऽन्त्यश्च लक्षणैस्तान् प्रचक्ष्महे॥ (च.चि. २३/४१)
३. ओजस्य विहते पूर्वो हृदि च प्रतिबोधिते। (च.चि. २३/३७)
४. प्रहर्षणः प्रीतिकरः पानान्नगुणदर्शकः। वाद्यगीतप्रहासानां कथानां च प्रवर्तकः॥
न च बुद्धिस्मृतिहरो विषयेषु न चाक्षमः। सुखनिद्राप्रबोधश्च प्रथमः सुखदोमदः॥ (च.चि. २३/४२-४३)
५. मध्यमो विहतेऽल्पे च। (च.चि. २४/३७)

मुहुः स्मृति	-	Remembers things
मुहुः मोह	-	Forgets things
व्यक्ता सज्जति वाङ्मुहुः	-	His voice becomes inarticulate and confused
युक्तायुक्त प्रलापश्च	-	He speaks sense and nonsense simultaneously
स्थान पान अन्न सांकथ्य	-	His movement, posture, drinking
योजना सविपर्यया ^१	-	eating and talking are all confused and funny.

- In this stage the person remains at the path of wrongful activities affected by wrong thinking assuming them to be happy ones.²
- After crossing the second stage and in the commencement of third stage of alcoholic intoxication, there comes a stage when there is no inappropriate thing a person of rajasa and tamasa nature cannot perform.
- This stage is called as Madaantara.
- No wise person would ever like to be in that stage, the result of which are affected with serious complications like those of insanity.³
- A person in this phase is like a wild elephant which is deaf and unrestrained and attains the predominance of rajas and tamas and does not restrain from wrong activities. This is the stage of all bad activities and beginning of all evil.⁴

३. तृतीय अवस्था (Third Stage) :

- To the third stage, ojas is entirely afflicted so as to produce the intoxicating effects.⁵

The following signs and symptoms are produced-

भग्न दार्विव निष्क्रियः	-	A person becomes inactive like a broken tree.
मद मोह आवृतमना	-	Mind is afflicted with intoxicating morbidities and unconsciousness.
जीवन्नपिमृतैः समः	-	Though alive, he resembles a dead person.

- He becomes incapable of recognising pleasing things and friends.
- He is soon deprived of all happiness for which he had taken alcohol.
- In this stage of intoxication, he loses the very sense of distinction of rightful, happy

१. मुहुः स्मृतिर्मुहुर्मोहोव्यक्तासज्जतिवाङ्मुहुः। युक्तायुक्तप्रलापश्चपचलायनमेवच॥
स्थानपानान्नसांकथ्ययोजनासविपर्यया। लिङ्गान्येतानिजानीयादाविष्टेमध्येमेमदे। (च.चि. २४/४४-४५)

२. द्वितीये तु प्रमादायतनेस्थितः। दुर्विकल्पहतोमूढः सुखमित्यवबुध्यते॥ (अ.सं.नि. ६/५)

३. मध्यममदमुत्क्रथ्यमदमाप्राप्यचोत्तमम्। नकिञ्चिन्नाशुभंकुर्युर्नशराजसतामसाः॥

कोमदंतादृशंविद्वानुन्मादभिवदारुणम्॥ (च.चि. २४/४६)

४. मध्यमोत्तमयोः सन्धिंप्राप्यंराजसतामसः। निरङ्कुशइवव्यालोनकिञ्चिन्नाचरेज्जडः॥ (अ.सं.नि. ६/६)

५.विहतेतुत्तमोमदः। (च.चि. २४/३७)

and useful items from the wrong, miserable and harmful ones.¹

- No wise person will ever like to place himself in such a stage of intoxication.
- He is condemned and criticized by all persons and disliked by them.
- As a natural outcome of this indulgence, he suffers from miseries and diseases all the time.²
- In this stage, the person lies on the ground, with less movements like a cadver, a greater sinner than the one who is dead, going through different stages of grave sins.³

Disorders Produced Due to Improper Madyapana :

If madya is used by a person who is in anger, frightened, thirsty, in grief or hungry or exhausted due to physical exercise, weight lifting or excessive walking and also those who have suppressed the natural evacuatory urges, have overloaded their stomach with excessively sour food, or in those who have eaten while the previous meal was still undigested and those who are weak or are suffering from heat exhaustion, it produces different types of disorders.⁴

Samanyalakshana of Madatyaya :

In general, the following signs and symptoms are produced in madatyaya.⁵

प्रमोह	-	Delusions
हृदयव्यथा	-	Pain in the region of the heart
विट् भेद	-	Diarrhoea
सततं तृष्णा	-	Constant thirst
सौम्यज्वरो	-	Fever having both heat and cold.
अरुचि	-	Loss of appetite.
शिरः पार्श्व अस्थि रुक्	-	Pain in the region of head, flanks and bones.
कम्प	-	Tremors
मर्मभेद	-	Cutting pain in vital parts.

१. तृतीयं तु मदप्राप्यभग्नदार्ढ्यनिष्क्रियः। मदमोहावृतमनाजीवन्नपिमृतैः समः॥

रमणीयान् स विषयान्नवेत्तिनसुहृज्जनम्। यदर्थपीयतेमद्यंरतितांचनविन्दति॥

कार्याकार्यसुखंदुःखंलोकेयच्चद्विताहितम्। यदवस्थोनजानातिकोऽवस्थांतां ब्रजेद्बुधः॥ (च.चि. २४/४६-५०)

२. स दूष्यः सर्वभूतानांनिन्द्यश्चाग्राह्यएवच। व्यसनित्वादुदक्रेच स दुःखंव्याधिमश्नुते॥ (च.चि. २४/५१)

३. निश्चेष्टः शववच्छेते तृतीये तु मदेस्थितः। मरणादपिपापात्मागतः पापतशंदशाम् ॥ (अं.सं.नि. ६/८)

४. कृद्धेनभीतेनपिपासितेनशोकाभितप्तेनबुभुक्षितेन। व्यायामभाराध्वपरिक्षतेनवेगावरोधाभिहतेनचापि॥

अत्यन्बुभुक्षाक्ततोदरेणसाजीर्णभुक्तेनतथाअबलेन। उष्णाभितप्तेनचसेव्यमानंकरोतिमद्यंविधिविधान्विकारान्॥ (मा.नि. १८/१३-१४)

५. सामान्यलक्षणं तेषांप्रमोहोहृदयव्यथा। विड्भेदः सततं तृष्णासौम्याज्वरोअरुचिः।

शिरः पार्श्वस्थिरुक्कम्पमर्मभेदत्रिकग्रहः। उरोविबन्धतिमिरंकासश्वासप्रजागरः॥

स्वेदोअतिमात्रंष्टिम्भः श्वयथुश्चित्तविभ्रमः। प्रलापश्छर्दि रुक्त्वलेशोभ्रमोदुःस्वप्नदर्शनम्॥ (अ.सं.नि. ६/१५-१७)

स्त्रिक ग्रह	-	Catching pain at the back.
उरो विबन्ध	-	Obstruction in the chest.
तिमिर	-	Blindness
कास	-	Cough
श्वास	-	Dyspnoea
प्रजागर	-	Loss of sleep
स्वेद अतिमात्र	-	Excessive perspiration
विष्टम्भ	-	Stasis of food in the abdomen.
श्वयथु	-	Swelling
चित्त विभ्रम	-	Disorders of the mind.
प्रलाप	-	Irrelevant talk.
छर्दि	-	Vomiting
उत्क्लेश	-	Excess salivation
भ्रम	-	Giddiness
दुःस्वप्न	-	Bad dreams

विशिष्ट लक्षण of मदात्यय/Specific Features :

In specific, madatyaya is of four kinds- each from vata, pitta, kapha and sannipataja, each kind has tridosa vitiation but named different on the basis of predominance of dosas¹.

Type	Etiology	Signs and Symptoms
1. Vataja	When a person excessively emaciated because of in-dulgence in stri (women), shoka (grief), bhaya (fear), bhara (carrying heavy load), adhwa karma (walking long distance and other strenuous activities) while eating rooksha aahara (ununctuous food), alpasana (less quantity of food), pramit-aashana (limited quantity of food) drinks alcohol which is rooksha in nature excessively it leads to vataja madatyaya. ²	Hikka Shwasa Shira kampa Paarshwa shoola Prajaagara Bahu pralaapa ³

१. वातात् पित्तात्कफात्सर्वैश्चत्वारः स्युर्मदात्ययाः। सर्वे अपिसर्वैर्जायन्तव्यपदेशस्तुभूयसा॥ (अ.स.नि. ६/१४)

२. स्त्री शोकभयभाराध्वकर्मभिर्योऽतिकर्षितः। रुछाल्पप्रमिताशीचयः पिबत्यतिमात्रया॥

रुक्षं परिणतं पदं निशि निद्रां विहत्य च। करोति तस्य तच्छीघ्रं वातप्रायं मदात्ययम्॥ (च.चि. २४/८७)

३. हिका श्वासशिरःकम्पपार्श्वशूलप्रजागरैः। विद्याद्बहुप्रलापस्य वातप्रायः मदात्ययम्॥ (च.चि. २४/९१)

Type	Etiology	Signs and Symptoms
2. Pittaja	If a person indulging in excessive madyapana which is teekshna (sharp) ushna (hot) and amla (sour), also has liking for amla, ushna and teekshna food and also has excess of anger, gets exposed to more of fire and sun, then he suffers from pittaja madatyaya. ¹	Trishna (thirst) Daha (Burning sensation) Jwara (fever) Sweda (sweating) Moorcha (fainting) Atisara (Diarrhoea) Vibrama (giddiness) Haritavarna (green colour of the body) ²
3. Kaphaja	If a young person who is habituated to madhura (sweet), snigdha (unctuous), guru (heavy) food eaten in excess, does not undertake exercise, sleeps during day time drinks madya in excess which is not fermented well or is generally sweet like guda and paistika, he develops kaphaja madatyaya. ³	Chardi (Vomiting) Arochaka (Anorexia) Hrillasa (Nausea) Staimitya (Timidity) Gaurava (Heavyness) Sheeta pareeta (Chilliness) ⁴
4. Sanni-pataja	Mixed causes of all dosas the three dosas.	Mixed features of all the three dosas.

Apart from the above, other diseases produced due to improper intake of madya include the following.⁵

- | | |
|---------------|---------------|
| (a) पानात्यय | (b) परमद |
| (c) पानाजीर्ण | (d) पानविभ्रम |

(a) पानात्यय (Panatyaya) :

Panatyaya is divided into the following four types depending upon the doshic predominance.

1. तीक्ष्णोष्णमद्यमम्लचयोऽतिमात्रं निषेवते । अम्लोष्णतीक्ष्णभोजी च क्रोधनोऽग्न्यातपश्चियः ॥ तस्योपजायते पित्ताद्विशेषेण मदात्ययः ॥ (च.चि. २४/१२)
2. तृष्णादाहज्वरस्वेदमूर्च्छातीसारविभ्रमैः । विद्याद्वरितवर्णस्य पित्तप्रायं मदात्ययम् ॥ (च.चि. २४/१४)
3. तरुणमधुरप्रायंगौडं पौष्टिकमेव वा । मधुरस्निग्धगुर्वाशीयः पिबत्यतिमात्रयाः ॥ अव्यायामदिवा स्वप्नप्रशय्यासनसुखेरतः । मदात्ययं कफप्रायं स शीघ्रमधिगच्छति ॥ (च.चि. २४/१५-१६)
4. छार्द्यरोचकहृल्लासतन्द्रास्तैमित्यगौरवैः । विद्याच्छीतपरीतस्य कफप्रायं मदात्ययम् ॥ (च.चि. २४/१६-१७)
5. पानात्ययं परमदेपानाजीर्णमथापि वा । पानविभ्रममुग्रं च ॥ (सु.उ. ४७/१७)

Type	Signs and Symptoms
1. Vataja panatyaya	Stambha, angamarda, hridgraha, toda, kampa, shiroruja. ¹
2. Paittika panatyaya	Sveda, pralapa, mukhasoshana, daha, murcha, vadanalochana peetaka. ²
3. Kaphaja panatyaya	Vamathu, sheetata, kapha praseka. ³
4. Sannipataja panatyaya	Symptomatology of all three doshas. ⁴

(b) परमद :

परमद is characterised by the following features⁵

ऊष्माण	-	Sense of heat in the body parts
अङ्गगुरुता	-	Heavyness in body parts.
विरसाननत्वं	-	Bad taste in the mouth
श्लेष्म अधिकत्वम्	-	Excessive accumulation of kapha in the body.
अरुचिम्	-	Tastelessness
मल-मूत्रसङ्गम्	-	Supression of stool and urine
तृष्णा	-	Thirst
शिरो रुज	-	Headache
संधि भेद	-	Crushing pain in the joints.

(c) पानाजीर्ण :

The following are the features of panajeerna.⁶

आध्मान	-	Distension of the abdomen
उद्विरण/छर्दि	-	Vomiting
अम्लरस	-	Acidic taste in the mouth
विदाह	-	Burning sensation
पानाजीर्ण	-	Symptoms of panajeerana

(d) पानविभ्रम :

The following are the feature of pana vibharma.⁷

- स्तम्भअङ्गमर्दहृदयग्रहतोदकम्पाः। पानात्यये अनिलतकृतेशिरसो रुजश्च॥ (सु.क. ४०/१७)
- स्वेदप्रलापमुखशोषणदाहमूर्च्छाः। पित्तात्मके वदनलोचनपीतताच॥ (सु.उ. ४७/१८)
- श्लेष्मात्मके वमथुशीतकफप्रसेकाः। (सु.उ. ४७/१९)
- सर्वात्मके भवति सर्वविकारसंपत्॥ (सु.उ. ४७/१९)
- ऊष्माणमङ्गगुरुतां विरसाननत्वं। श्लेष्माधिकत्वमरुचिर्मलमूत्रसङ्गम्॥
लिङ्गपरस्य तु मदस्य वदन्ति तज्ञा। स्तृष्णां रुजां शिरसि सन्धिषु चापि भेदम्॥ (सु.उ. ४७/१९)
- आध्मान उद्विरण अम्लरसो विदाहोऽजीर्णस्य पानजनितस्य वदन्ति लिङ्गम्।
ज्ञेयानि तत्र भिषजा सुनिश्चितानि पित्तप्रकोपजनितानि चकारणानि॥ (सु.उ. १७/२०)
- हृद्वात्रतोदवमथुज्वरकण्डू धूममूर्च्छा कफस्रवणमूर्धरुजो विदाहः।
द्वेषः सुरात्रविकृतेषु च तेषु तेषु तं पानविभ्रममुशन्त्यखिलेन धीराः॥ (सु.उ. ४७/२१)

हृद्वात्रतोद	-	Piercing pain in the heart and limbs.
वमथु	-	Vomiting
ज्वर	-	Fever
कण्ठ स्त्रवण	-	Feeling of rising of fumes into the throat.
मूर्च्छा	-	Fainting
कफ स्त्रवण	-	Salivation
मूर्ध रुज	-	Headache
विदाहः	-	burning sensation in the throat.
द्वेषः सुर अन्न	-	Aversion to all sorts of food and wine.

ध्वंसक and विक्षय- Dhvamsaka and Vikshaya :

- If a person who has stopped drinking alcohol, suddenly takes recourse to drinking alcohol in excess, he suffers from two diseases, viz, dhvamsaka and vikshaya.¹

ध्वंसक- Dhvamsaka :

The following are the signs and symptoms of Dhvamsaka².

श्लेष्म प्रसेकः	Excessive salivation
कण्ठास्य शोषः	Dryness of the throat and mouth
शब्दासहिष्णुता	Intolerance to noise
तन्द्रा अतियोग	Excessive drowsiness
निद्रा अतियोग	Excessive sleep

विक्षय Vikshaya:

The following are the signs and symptoms of vikshaya.³

हृत्कण्ठ रोग	Cardiac and throat diseases
संमोह	Unconsciousness
छर्दि	Vomiting
अङ्ग रुजा	Pain in the limbs
ज्वरः	Fever
तृष्णा	Thirst
कास	Cough
शिरःशूल	Headache

१. विच्छिन्नमद्यः सहसायोऽतिमद्यं निषेवते। ध्वंसको विक्षयश्चैव रोगस्तस्योपजायते॥ (च.चि. २४/१९९)

२. श्लेष्म प्रसेककण्ठास्थशोषः शब्दासहिष्णुता। तन्द्रानिद्रा अतियोगश्च ज्ञेयं ध्वंसकलक्षणम्॥ (च.चि. २४/२०१)

३. हृत्कण्ठ रोगः संमोहछर्दि अङ्गरुजा ज्वरः। तृष्णा कासः शिरःशूलमेतद्विक्षयलक्षणम्॥ (च.चि. २४/२०२)

Treatment of Madatyaya मदात्यय चिकित्सा :

1. Doshaja Chikitsa-

- All the varieties of madatyaya are of tridoshaja therefore, in the beginning, treatment should be done for the most predominant dosha.
- If all the dosha are equally aggravated, then treatment should be done first for the location of kapha, followed by pitta and lastly vata.¹

2. Madyapana-

The ailments caused by the drinking of madya in mithya yoga or in atiyoga or in hina yoga can be cured by taking the madya in appropriate manner and quantity (samayoga)²

After the morbidity caused by the improper digestion and metabolism of madya is overcome by its proper digestion and metabolism, when the patient desires to have food and drinks, when there is a feeling of lightness of the body, he should be given madya which is wholesome, mixed with sauvarcala lavana added with bida and saindhava lavana and which is diluted with the juice of matulunga and water by a physician mastered in posology³ [Appropriate quantity].

3. Specific Regimens-

Specific regimens must be followed as treatment modality in madatyaya which include:

Walk in beautiful forests, alongside ponds and lakes with lotus flowers, intake of clean food and drinks, having exciting companions, use of garlands and perfumes, wearing clean garments, listening to musical performances being with pleasing and delightful companions, recitation of refreshing stories, jokes and songs and being in companionship of lovely and devoted women.⁴

4. Psycho Therapy for Alcoholism-

Alcohol does not cause alcoholism without causing agitation of the mind and without causing morbidity in the body. Therefore, to a patient suffering from alcoholism therapeutic measures (psycho-therapy) for the cheerfulness of the mind should be administered.⁵

१. सर्वमदात्ययं विद्यात् त्रिदोषमधिकं तु यम् । दोषमदात्यये पश्येत् तस्यादौ प्रतिकारयेत् ॥
कफस्थानानुपूर्व्या च क्रियाकार्या मदात्यये । पित्तमारुतपर्यन्तः प्रायेण हि मदात्ययः ॥ (च.चि. २४/१०७-१०८)
२. मिथ्य अति हीन पीतेन यो व्याधिरुपजायते । समपीतेन तेनैव स मद्येनोपशाम्यति ॥ (च.चि. २४/१०८)
३. जीर्णममद्यदोषाय मद्यमेव प्रदापयेत् । प्रकाङ्खलाघवे जाते यद्यदुस्मै हितं भवेत् ॥
सौवर्चलानुसंविद्धं शीतं सविड सैन्धवम् । मातुलुङ्गार्द्रकोपेतं जलयुक्तं प्रमाणवित् ॥ (च.चि. २४/१११)
४. वनानिरमणीयानि समध्माः सलिलाशयाः । विशदान्यन्नपानानि सहायाश्च प्रहर्षणाः ॥
माल्यानि गन्धयोगाश्च वासांसि विमलानि च । गान्धर्वशब्दाः कान्ताश्च गोष्ठयश्च हृदयप्रियाः ॥
संकथाहास्यगीतानां विशदसच्चैव योजनाः । प्रियाश्चानुगतानां यो नाशयन्ति मदात्ययम् ॥ (च.चि. २४/१११-११३)
५. नाक्षोभ्यहि मनो मद्यशरीरमविहत्य च । कुर्यान्मदात्ययतस्मादेज्ज्वल्य हर्षणीक्रिया ॥ (च.चि. २४/११४)

5. Ksheera Prayoga-

If all the above mentioned therapeutic measures fail to cure alcoholism, then physician should give up therapies comprising alcohol and administier milk for its treatment.

After giving up alcohol, because of langhana, pachana, dosha-shodhana and shamana, kapha gets diminished, the body of the patient becomes weak as well as light.

For this type of patient where in vata and pitta are aggravated, milk is exceedingly wholesome like the rain for a tree afflicted with hot summer.¹

Treatment of Specific Types of Madatyaya :

1. Vataja Madatyaya-

Madyapana

- In vataja madatyaya, madya should be specifically administered for the liquefaction of the dosha with its vyavayi, teekshna and ushna gunas.²
- Madya removes the obstruction in the channels of circulation, helps in the downward movement of vayu, acts as an appetiser, stimulates the power of digestion and becomes wholesome when consumed habitually.³

Recipe :

- Madya prepared of the paste of cereals (paistika-madya) mixed with bijapuraka, vrikshamla, kola and dadima and sprinkled with the powder of yavani, hapusha, ajaaji, and shringavera should be taken along with salt.

While taking this madya, patient should take delicious snacks prepared of saktu by adding ghee.⁴

Meat soup :

- Soup of meat of lava, tittira, daksha (cock) and peacock.
- Soup of birds or animals and fish inhabiting marshy land and burrows.
- Meat of prasaha (those who eat their food by snatching) type of animals, along with shali rice.⁵

१. आभिः क्रियाभिः शमंयातिमदात्ययः । नचेन्मद्यविधिमुत्तवा क्षीरमस्यप्रयोजयेत्॥
लङ्घनैः पाचनैर्दोषशोधनैः शमनैरपि । विमद्यस्यकफे क्षीणेजातेदौर्बल्यलाघवे॥
तस्यमद्यविदग्धरू वातपित्ताधिकस्यच । ग्रीष्मोपतप्तस्यतरोर्यथा वर्षतथापयः॥ (च.चि. २४-४५-११७)

२. दोष विष्यन्दनार्थहितस्मैमद्यविशेषतः । व्यवायितीक्ष्णोष्णतयादेयमम्लेषुसत्स्वपि॥ (च.चि. २४/११८)

३. स्रोतोविबन्धनुन्मद्यमारुतस्यानुलोमनम् । रोचनंदीपनंचाग्रेरभ्यासात्सात्म्यमेवच॥ (च.चि. २४/१७९)

४. बीजपूरक वृक्षाम्लकोलदाडिमसंयुतम् । यवाजीहपुषाजाजीशृङ्गवेशवचूर्णितम्॥
शस्नेहैः शक्तुभिर्युक्तमवदंशैर्विरोचितम् । दद्यात्सलवणंमद्यंपैष्टिकंवातशान्तये॥ (च.चि. २४/१२१-१२२)

५. लावतित्तिरदक्षाणांस्निग्धाम्लैः शिशिनामपि । पक्षिणांमृगमत्स्यानामानूपानांचसंस्कृतैः॥
भूशयप्रसहानाचरसैः शाल्योदनेनच॥ (च.चि. २३/१२३-१२४)

Veshavara and Poopalikas :

- Veshavara, a type of appetiser added with ghee, ushna dravyas, salt and sour articles and poopalikas (pan-cakes) prepared of masha are useful.¹

Post-prandial Drinks :

- After taking food, if the patient feels thirsty, he should be given the supernatant part of varuni type of wine or juice of dadima or decoction of panchamoola or decoction of dhanya and nagara or supernatant part of curd or supernatant part of sour kanji or vinegar to drink.²

Other Regimens :

- Intake of meat, vegetables, pastries, barley, wheat, shali rice mixed with raga and shadavas.
- Massage, unction and bath with hot ingredients.
- Wearing of thick blanket.
- Application of thick paste of aguru, thick fumigation with smoke of aguru.
- Strong embracement of ladies.
- Use of warm beds and bedsheets etc³.

2. Pittaja Madatyaya :**Madyapana-**

- Sharkara/mardvika type of madya along with sugar and juice of bhavya, kharjoora, mridveeka and parushaka or juice of dadima, after making them cool, after sprinkling saktu over them and after diluting with large quantity of water.⁴

Food :

- Meat of shasha, kapinjala, ena, lava which have asita-puccha.
- Sweat or sour ingredients.
- Shali and shastika type of rice⁵

१. स्निग्धोष्ण लवणाम्लैश्चवेशवारैर्मुखप्रियैः । चित्रैर्गोधूमिकैश्चात्रैर्तारुपीमण्ड संयुतैः॥
पिशितार्द्रकर्माभिः स्निग्धाभिपूषनर्तिभिः । माषपूपलिकाभिश्चवातिकंसमुपाचरेत्॥ (च.चि. २३/१२५-१२६)

२. भुक्ते तु वारुणीमण्डं दद्यात्पातुं पिपासवे । दाडिमस्यरसं वाऽपि जलवापाञ्चमूलिकम्॥
धान्यानागरतोयचदधिमण्डमथापिवा । अम्लकाञ्जिकमण्डं वा शुक्तोदकमथापिवा॥ (च.चि. २४/१२९-१३०)

३. रागषाडव संयोगैर्विविधैर्भक्तिरोचनैः । पिशितैः शाकपिष्टान्नैर्यवगोधूमशालिभिः॥ अभ्यङ्गोत्सादनैः स्नानैरुष्णैः प्रावरणैर्धनैः ।
घनैरगुरुपङ्कजैश्च धूपैश्चागुरुजैर्धनैः ।
नारीणां यौवनोष्णानां निर्दयैरुपगूहनैः॥ (च.चि. २४/१३२-१३५)

४. भव्यखजूरमृद्वीका परुषकरसैर्युतम् । सदाडिमरसं शीतं सक्तुभिश्चावपूर्णितम् ।
सशर्करं शार्करवामार्द्राकमथवाऽपरम् । दद्याद्बहुदकं काले पातुं पित्तमदात्यये॥ (च.चि. २९/१३६-१३७)

५. शशान् कपिञ्जलान् एणलावानसितपुच्छकान् । मधुराम्लान् प्रयुञ्जीत भोजने शालिषष्ठिकान्॥ (च.चि. २४/१३८)

Soup :

- Soup of meat of goat prepared by adding soup of patola or mudga, mixed with dadima and amalaka.
- Different types of tarpana, yusha and rasa should be prepared by adding juice of draksha, amalaka, kharjura and parushaka.¹

वमन / Emetic Therapy :

- If kapha and pitta located in the amashaya are increased, if there is morbidity or if patient is suffering from burning sensation and morbid thirst, administer madya, grape juice, water or tarpana and there after, vamana is done to eliminate the morbid matter completely².

Samsarjana Krama :

- When patient is hungry, tarpana etc should be given in a manner by which power of digestion gets stimulated and the residual doshas and foods get digested³.

Other Regimens :

- Other appropriate regimens may be followed like intake of cooling food and drinks, use of cooling beds and seats, contact of cold air and water, movement in cool garden, hearing of pleasing stories and so on⁴.

3. Kaphaja Madatyaya :

- Vamana
- Upavasa⁵
- If there is thirst-decotion of hribera, bala, prsniparni or kantakari.⁶
- Administration of water boiled with either dusparsha and musta or musta and parpataka or musta alone for pachana of dosas⁷.
- When the patient is free from ama, he may be given sharkara, madhu, old arishta, sidhu along with honey by adding ununctuous type of tarpana, yavani and nagara.⁸

१. पटोलयूष मिश्रवाध्वागलकल्पयेद्रसम् । शतीनमुद्रमिश्रवादाडिमामलकान्वितम् ॥
द्राक्षामलकं खर्जूरं परूषकरसेन । कल्पयेत्तर्पणम्यूषान् रसांश्च विविधात्मकान् ॥ (च.चि. २४/१३९-४०)
२. आमाशयस्य उत्क्लिष्टं कफपित्तं मदात्यये । विज्ञाय बहुदोषस्य दह्यमानस्य तृषयतः ॥
मद्यं द्राक्षारसं तोयं दत्वा तर्पणमेव वा । निशेषं वामयेच्छीघ्रमेवं रोगद्विमुच्यते ॥ (च.चि. २४/१४१-१४३)
३. काले पुनस्तर्पणाद्यं क्रमं कुर्यात् प्रकाङ्क्षते । तेनाग्निर्दीप्यते तस्य दोष शोषात्र पाचकः ॥ (च.चि. २४/१४३)
४. शीतलान्वत्रपानानि शीतशय्यासनानि च । शीतवातजलस्पर्शाः शीतान्युपवनानि च ॥
क्षौमपद्मोत्पलानां शीघ्रपित्तमदात्यये ॥ (च.चि. २४/१५२-१६३)
५. उल्लेखन उपवासाभ्यां जयेत् कफमदात्यये ॥ (च.चि. २४/१६४)
६. तृष्यते सलिलं चास्मै दद्याद् धीबेरसाधितम् । बलया पृश्निपर्ण्या वा कण्टकार्याऽथ व शृतम् ॥ (च.चि. २४/१६५)
७. दुःस्पर्शेन समुस्तेन मुस्तर्पणं केन वा । जलमुस्तैः शृतं वाऽपि दद्याद् दोष विपाचनम् ॥ (च.चि. २४/१६६)
८. निरामकाङ्क्षितं काले सक्षौद्रं पाययेत्तुम् । शार्करमधुवाजीर्णमरिष्टं सीधुमेव वा । रुक्ष तर्पणसंयुक्तं यवानीनागरान्वितम् ॥ (च.चि. २४/१६८-६९)

Food and Drinks :

- Food prepared of barley and wheat along with the ununctuous soup of kulattha or dried radish.¹
- Meat mixed with different drugs are to be administered.²
- Administration of wholesome madya.³
- Administration of Ashtanga lavava for srotoshodhana and agni deepana.⁴

Other Regimens :

- Other regimens to be administered include hot water bath, physical exercise, remaining awake at night hours, wearing of heavy clothings, and application of paste of aguru all over the body etc.⁵

Sannipataja Madatyaya :

- The therapeutic measures described for the treatment of the three different types of alcoholism separately for each dosha should be carefully combined by the wise physician for the treatment of sannipata madatyaya, which may be of 10 types.⁶

Treatment of Dhvamsaka and Vikshaya :

- Since both dhvamsaka and vikshaya appear in emaciated and weak person, their treatment should be done on the line suggested for the treatment of vatika type of madatyaya.
- Patient should be given basti, sarpi, milk, ghee, massage, unction, bath, food and drinks which cause alleviation of vata.⁷

Management of Panatyaya

Type	Treatment
1. Vataja panatyaya	• Madya saturated with drugs like chukra, maricha, adraka, deepya, kushta and sauvarchala lavana. • Madya mixed with prithvika, deepyaka, mahoushadi and hingu or sauvarchala lavana.

१. यावगौधूमिकंचान्नं रूक्षयूषेणभोजयेत् । (च.चि. २४/१७०)

२. छागमांसरसं रूक्षमम्लं प्रभूतार्द्रकपेशिकम् ॥ (च.चि. २४/१७३-१७६)

३. पिबेच्चनिगदंमद्यं कफघ्नयेमदात्यये । (च.चि. २४/१७६)

४. सौवर्चलअजाजी स्रोतोविशोधनम् ॥ (च.चि. २४/१७७-७८)

५. रूक्षोष्णोनात्रपानेनस्नानेनाशिशिरेणच शीघ्रमेवोपशाम्यति । (च.चि. २४/१८५-१८८)

६. यदिदं कर्म निर्दिष्टं पृथग्दोषबलप्रति । सन्निपातेदशविधेतद्विकल्पभिषग्विदा ॥ (च.चि. २४/१८९)

७. तयोः कर्मतदेवेष्टं वातिकेयन्मदात्यये । तौहिप्रक्षीणदेहस्यजायेतेदुर्बलस्य वै ॥

बस्तयः सर्पिषः पानप्रयोगः क्षीरसर्पिषोः । अभ्युद्गोद्वतनस्नानअन्नपानंचवातनुत् ॥

ध्वंसकोविश्वयश्चैवकर्मणाऽनेनशाम्यति ॥ (च.चि. २४/२०३-२०५)

Type	Treatment
2. Pittaja panatyaya	• Shadava or panaka made of amrataka, aamraphala, dadima and matulunga. • Cooked flesh of animals of anupadesa like tortise etc should be seasoned with expressed juice of above fruits and taken.¹ • Madya mixed with the decoction of drugs of madhura varga saturated and flavoured with the mixture of sugar of scented drugs. • Madya profusely mixed with the juice of sugarcane should be taken and fully vomited out a short while later. • Rasa of lava, ena and tittira with mudga soup should be taken with sugar and clarified butter.²
3. Kaphaja panatyaya	• Madya mixed with juice of bimbi and vidula. • Meat soup of fatty jangala animal mixed with bitter and pungent articles. • Mudga soup which is bitter and pungent. • Diet of preparations of barley, flesh of jangala animals and kaphahara articles.³
4. Sannipataja panatyaya	• Combination of the above three varieties as required according to predominance of dosha.⁴

Management of Paramada :

- Panaka made of fruit of kashmarya, daru, dadima, vida, pippali and draksha along with juice of beejapuraka.⁵
- Panaka made of sugar, draksha, madhuka, jeeraka, dhanya, krishna/pippali and trivrit.⁶
- Mamsa rasa of any jangala animal mixed with souvarchala lavana and phalamla.⁷

१. मद्यं तु चुक्रमरिचार्द्रकदीप्यकुष्ठ सौवर्चलायुतमलंपवनस्यशान्त्यै। पृथ्वीकदीप्यकमहौषधहिङ्गुभिर्वासौवर्चलेनचयुतंवितरेत्सुखाय॥

आम्रातकआम्रफलदाडिममातुलुङ्गैः कुर्याच्छुभान्यपिचषाडव पानकानि।

सेवेतवाफलरसोपहितान्सादीन्आनूपवर्गपिशितान्यपिगन्धवन्ति॥ (सु.उ. ४७/२४-२६)

२. पित्तात्मकेमधुरवर्गकषायमिश्रं। मद्यंहितंसमधुशर्करमिष्टगन्धम्॥पीत्वाचमद्यमपिचइक्षुरसप्रगाढं निःशेषतः क्षणमवस्थितमुल्लिखेच्च। लावैणितित्तिरिसांश्चपिबेदनम्लान्मौद्गान्सुखायसघृतान्ससितांश्चयूषान्॥ (सु.उ. ४७/२६-२७)

३. पानात्ययेकफकृतेकफमुल्लिखेच्चमद्येनबिम्बविदुलोदकसंयुतेन। सेतेतत्तत्कटुकांश्चरसानुदरान्यूषांश्चतत्कटुकोपहितान्हिताय॥ पथ्ययवात्रविकृतानिचजाङ्गलानिश्लेष्मघ्नमन्यदपियच्चनिरत्युयंस्यात्॥ (सु.उ. ४७/२८)

४. कुर्याच्चसर्वमथसर्वभवेविधानंद्वन्द्वोद्भवद्वयभवेक्षयथाप्रधानम्॥ (सु.उ. ४२/२९)

५. काश्मर्यदारु विड दाडिमपिप्पलीषुद्राक्षान्वितासुकृतमम्बुनिपानकंयत्॥ (सु.नि. ४७/३४)

तद्वीजपूरकरसायुतमाशुपीतंशान्तिपरांपरमदेत्वचिरात्करोति॥

६. द्राक्षासितामधुकजीरकधान्यकृष्णासेवंकृतंत्रिवृतयाचपिबेत्तथैव।

७. सौवर्चलायुतमुदारसंफलाम्लं।

- Seka with Bhargi infusion.¹

Management of Panaajeerna :

- Vomiting should be induced with an anjali measure of milk cooked with Ikshvaku, dhamargava, vrikshaka and two kinds of udumbara.
- Madyapana should be done following vama, in the evening.²
- Intake of phalamla prepared with twak, pippali, nagapushpa, vida, hingu, maricha and ela. A compound consisting of saindhava, vida, tvak, chavya, ela, hingu, pippali, pippali roots, and shunthi pounded and dissolved in warm water should be taken.³

Management of Panavibhrama :

- Panaka composed of draksha, kapitta phala and dadima sweetened with sugar and honey.
- Panaka with juice of kola and amrataka.
- Hima prepared with kharjura, vetra, karira, parushaka, draksha and trivrit either with sugar or sriparni.
- Tender sprouts of kshirivriksha, bisa, jeeraka etc.⁴

Ethanol-Ethyl Alcohol- C_2H_5OH

The term alcohol refers to ethyl alcohol.

Physical Characteristics :

- It is a transparent colourless, volatile liquid, having a characteristic spiritous odour and a burning taste.
- It is an active ingredient of many active social beverages like wines, beers, whiskeys, brandies etc.
- The approximate percentage of alcohol by volume in some of the common beverages:

Beverage	% of Alcohol
Vodka	60-65%
Rum, Liquor	50-60%
Whisky, Gin, Brandy	40-45%
Port, Sherry	20%

1. भार्गीशृतेनचजलेनहितोऽवसेकः। (सु.उ. ४७/३६)
2. इक्ष्वाकुधामार्गव वृक्षकाणिकाकह्वयोदुम्बरिकाश्चदुग्धे। विपाच्यतस्यजलिनावमेद्धिमद्यं पिबेच्चाग्निगतेलजीर्णे।। (सु.उ. ४७/३७)
3. त्वक्पिप्पलीभुजगपुष्प बिडैरुपेतं। सेवेतहिङ्गुमरिचैलयुतंफलाम्लम्।।
उष्णाम्बुसैन्धवयुतास्त्वथवाविडत्वकचव्यैलहिङ्गुमगधाफलमूलशुण्ठीः।। हृद्यैः खडैरपिचभोजनमत्रशस्तं।। (सु.नि. ४७/३८)
4. द्राक्षाकपित्यफलदाडिमपानकंयत्तत्पानविभ्रमहरंमधुशर्कराढ्यमाप्रातकोलरसपानकमेवचापि।
.....पानोद्भवानुदतिसप्तगदानशेषान्।। (सु.उ. ४४/३९-४२)

Beverage	% of Alcohol
Wine, Champagne	10-15%
Beers	4-8%
Country liquor	11-46%

Absorption of Ethyl Alcohol :

- Alcohol requires no digestion prior to absorption. Its small molecular size permits it to pass readily through membranes by simple diffusion.
- Absorption from the stomach and small intestine begins immediately upon ingestion.
- About 20% is absorbed from the stomach and 80% through small intestine.
- The maximum concentration in blood is reached within 45-90 min after ingestion.
- The rate of absorption depends upon:-
 - a) Concentration of alcohol in the fluid imbibed.
 - b) Presence or absence of food in the stomach.
 - c) Condition of the stomach wall.
 - d) Rate of drinking.
 - e) Quantity of alcohol ingested.
 - f) Weight of the person.
 - g) Development of tolerance.
- Alcohol is absorbed more rapidly from concentrated than from dilute solutions.

Metabolism :

- Approximately 90% of absorbed alcohol is oxidised in the liver, the remaining 10% being excreted mainly by the kidneys and lungs.
- Normally, the body can metabolise about 1/2 fluid ounce of absolute alcohol every hour. (roughly equalent to one drink).
- If the intake exceeds this measure, the subject manifests signs and symptoms of drunkenness.
- The average fall is around 15-18 mg ethanol per 100 ml of blood per hour.

Acute Ethyl Alcohol Poisoning :

- Acute ethyl alcohol poisoning causes three phases of intoxication.

1. Stage of Excitement :

- In this stage there is depression of the higher centres which control judgement and behaviour.

- Blood alcohol level is 30-100mg%
- There is a feeling of well being and slight excitation.
- There is increased confidence and lack of self control.
- Person may disclose secrets.
- Normal good manners are forgotten.
- Patient converses well, laughs and smiles readily and becomes angry easily.
- He may behave in an obscene manner or talk in a vulgar language.
- Sexual desire may be aroused.

2. Stage of Inco-ordination :

- There is incoordination of thought, speech and action.
- There is impaired judgement, confusion, slurred speech and staggering gait.
- The drinker may suffer from hiccups and is untidy in his appearance.
- He may become morose, euphoric or irritable depending on his inherent emotions.
- Nausea and vomiting are common.
- Pupils are dilated.
- Impaired judgement may lead to accidents, sexual excesses, violence and crime.
- The breath smells of alcohol.
- Face is flushed and pulse is rapid.
- Sense of touch, taste, smell and hearing are diminished.

3. Stage of Coma/Narcosis :

- The motor and sensory cells are deeply affected.
- Speech becomes thick and slurring.
- Coordination is markedly affected.
- Patient may be giddy, may stagger and possibly fall.
- **Mc Ewan sign:-** The pupils are contracted, but stimulation of the person by pinching or slapping causes them to dilate with slow return.
- This sign helps to differentiate comatose conditions from alcoholic coma.

Recovery :

- With recovery, coma gradually lightens into a deep sleep and the patient usually recovers in 8-10 hrs.
- He wakes up with acute depression, nausea, abdominal discomfort, irritability,

lethargy and severe headache - all these constituting the "Hangover"

- If coma continues for more than 5 hrs, prognosis is worse.
- Death occurs from asphyxia due to respiratory paralysis or from shock.

Fatal Dose: 150-250ml of absolute alcohol consumed in 1 hr.

Fatal Period: 12-24 hrs

Treatment :

1. Gastric lavage with 5% solution of sodium bicarbonate in warm water.
2. Keep the patient warm.
3. Treatment of hypoglycaemia and saline.
4. Saline purges/IV hypertonic glucose to reduce the intracranial pressure.
5. Artificial respiration in respiratory depression.
6. Haemo/peritoneal dialysis when required.

P.M. Appearances :

- Alcoholic odour on opening the cavities of the body.
- Acute inflammation of stomach with a coating of mucus.
- Brain, liver and lungs are congested.
- Smell of alcohol in the viscera.
- Oedema and congestion of the brain and meninges.
- Rigor mortis lasts longer than usual.

Medico-legal Aspects :

- Poisoning by alcohol is common in India, though death directly by its ingestion is few.
- There is liabilities to fatal complications like head injuries, serious bleeding from trivial injuries, suffocation, drowning etc.
- A strong relationship exists between alcohol, crime and violence.
- Chronic alcoholism is a common cause of sexual jealousy crimes, especially those of homicidal nature.

Consent for Examination :

- The consent of the detained person to medical examination is necessary.
- If the person is unconscious or otherwise not in a fit condition to give consent, the doctor called by the police should not disclose to the police any information he obtained during his examination, but should wait to get the consent of the patient when he regains consciousness or is in a fit condition to be asked.

Alcohol Intoxication and Driving a Motor Vehicle :

- Alcohol reduces or even eliminates the skill and the mental acuity required for driving a motor vehicle safely.
- Alcohol causes faulty depth perception, poor peripheral vision, distorted colour vision and reduced night vision. It also impairs the driver's ability to judge the distance between vehicles moving.
- Driving ability is impaired even in the hangover phase due to the after effects of alcohol on judgement, perception, reaction time and coordination.
- Hence driving is to be avoided after consumption of alcohol.

Chronic Poisoning (Alcoholic Addiction) :

- Chronic poisoning results from continued use of alcohol.
- Alcohol addicts are people who cannot stop drinking for long or who experience withdrawal symptoms if they do.
- Chronic alcoholics reach a state of irreversible somatic or brain changes caused by alcohol.
- It is characterised by a gradual physical, moral and mental deterioration.

Physical Degeneration :

- Lack of personal hygiene.
- Loss of appetite, nausea, vomiting, anorexia, diarrhoea, jaundice.
- Chronic gastroenteritis.
- Wasting
- Peripheral neuropathies.
- Impotence and sterility.
- Fatty changes in the liver and heart.
- Cirrhosis of the liver as it is a hepatotoxic poison.
- Tremors of the tongue and hands, insomnia, loss of memory, impaired power of judgement, hypoproteinaemia, general anasarca.

Moral Degeneration :

- It manifests as crimes which the addict commits to get his drink.

Mental Degeneration :

It results in dementia.

Apart from the above, three common clinical syndromes are noticed.

1. Delirium tremens
2. Korsakoff's psychosis.

3. Acute hallucinosis.

Delirium tremens-State of excitement with hallucinosis chiefly visual and occasionally auditory. Such a patient may be violent with tendency of homicide or suicide.

Korsakoff's psychosis-Is a syndrome characterised by hallucinations, disorientation and multiple neuritis.

Acute hallucinosis-Is a state of hallucination chiefly auditory and patient may become homicidal or suicidal in response to his hallucinations.

Drunkenness :

- Drunkenness is a condition which results from excessive intake of alcohol and the person is so much under its influence that he loses control over his mental faculties, is unable to perform his duties or occupation on which he is engaged at a particular time and he may be a source of danger to himself and to others.
- Drunkenness in itself is not a crime unless it is done in no prohibition or accompanied by some act of commission or omission which causes danger to the life or property of the individual or others.
Ex: Drunk and being disorderly.
- Drunk and driving.
- Doctor drunk and negligently operating on a patient etc.

Diagnosis of Alcohol Consumption :

1. Clinical Examination:

- Smell of alcoholic beverage in his breath or vomited matter.
- Manifestation of symptoms specific to alcoholism like most necessarily loss of self control, disordered clothing, sluggish dilated pupils, slurred or incoherent speech, unsteady gait, confused mental state, impaired memory for recent events and so on.

2. Laboratory Tests-

- Common laboratory tests include estimation of alcohol from blood, urine, breath in living and vitreous fluid, bile and other tissues at autopsy.

Alcohol and Prohibition

- Alcohol is a drug of addiction and is responsible for many socio-economic problems, crimes, morbidity and mortality.
- It is a contributory factor in many deaths.
- Therefore some states in India and elsewhere have imposed prohibition laws in an effort to reduce the magnitude of problem.
- In places where prohibition is in force, drinking without a permit is a crime and also

possession of liquor without a license.

The Bombay Prohibition Act (BPA) :

- This act is in relation to drinking, drunkenness, pleas in relation to drinking of non-prohibited preparations and possession of intoxicants.

Sec. 84- Provides penalty for being found drunk or drinking in a common drinking house.

Sec 85- Provides punishment for being drunk and disorderly in any street or public place.

Sec 66 (2)- If blood alcohol concentration is $>0.05\%$ the accused has to prove that the consumption of alcohol was medicinal or otherwise.

Sec. 129(A), Sec 53(1) C.P.C and Sec. 54 Cr.P.C.- Medical examination of an alcoholic, if accused, can be done without consent and at the request of police officer and sample of blood can be collected for chemical analysis.

Methanol-Methyl Alcohol: CH_3OH

Wood Alcohol/Wood Spirit/Carbinol/Methanol

Physical Characteristics-

- Methyl alcohol is a colourless liquid with a faint spirit like odour and a burning nauseous taste.
- It is used in industry for denaturing rectified spirit so as to render it non-drinkable.
- It is present in certain home made beverages, antifreeze in gas lines, paint removers, dyes, resins, adhesives and varnish.

Signs and Symptoms :

- Symptoms may appear within an hour after ingestion but are commonly delayed.
- Nausea, vomiting, pain in the abdomen, headache, dizziness etc.
- Marked muscular weakness.
- Depressed cardiac action.
- Spirit like odour in breath.
- Dyspnoea, cyanosis.
- Acidosis results from accumulation of acid metabolites.
- Temporary blindness or atrophy of optic nerves resulting in permanent blindness.
- Convulsions as a terminal event.
- Death occurs from respiratory failure.

Fatal dose: 60-200 ml

Fatal period: Death within 24-36 hrs may be delayed by 2-4 days.

Treatment :

1. Gastric lavage with 5% bicarbonate solution.
2. Activated charcoal.
3. Antidote : 1. Ethanol- IV as 10% solution, starting with 500 ml as an infusion and repeated as required.
2. 60 ml of ethyl alcohol in 200 ml fruit juice can be given orally over a period of 30 min.
4. Haemodialysis in severe cases.
5. 4 MP/Fomepizole - 15mg/kg of 4 MP- 1st dose 10 mg/kg 12th hrly x 4 doses- after 12 hrs of 1st dose.
6. Folic acid - 50-75 mg/4 hrly.
7. Soda bicarbonate IV to correct metabolic acidosis.

P.M. Appearance :

- Cyanosis is marked.
- Cerebral and pulmonary oedema.
- GIT mucosa is inflamed.
- Liver show necrobiosis and kidneys show tubular degeneration.

Medico-legal Aspects :

- Accidental poisoning may occur.
- Poisoning is generally due to consumption of liquor containing methyl alcohol by drinkers of cheap Illicit liquor.

Important Questions**Short Essay:**

1. Types of Madatyaya.
2. Mada.
3. Stages of Alcohol poisoning.

Short Answers:

1. Dwamsaka and Vikshaya.
2. Alcohol poisoning.

NDPS Act

Narcotic Drugs and Psychotropic Substances Act, 1985

- The NDPS act is an act to consolidate and amend the law relating to narcotic drugs, to make stringent provisions for the control and regulation of operations relating to narcotic drugs and psychotropic substances, to provide for the forfeiture of property derived from, or used in, illicit traffic in narcotic drugs and psychotropic substances, to implement the provisions of the International Convention on Narcotic Drugs and Psychotropic Substances and for matters connected there with.
- The Narcotic Drugs and Psychotropic Substances Act, commonly referred to as the NDPS Act, is an Act of the Parliament of India that was approved on 16 September 1985, and came into force on 14 November 1985.
- The Narcotic Drugs and Psychotropic Substances Bill, 1985 was introduced in the Lok Sabha on 23 August 1985.
- Under the NDPS Act, it is illegal for a person to produce/manufacture/cultivate, possess, sell, purchase, transport, store, and/or consume any narcotic drug or psychotropic substance.
- The Act extends to the whole of India and it applies also to all Indian citizens outside India and to all persons on ships and aircraft registered in India.
- This act is explained in various chapters.
- **In Chapter I**, the definition of the various terms used in the act are described like - cannabis, coca derivative, coca leaf, controlled substance, conveyance, illicit traffic, manufacture, manufactured drug, medicinal cannabis, opium, narcotic drug etc.
- A narcotic drug may be Opium and opium alkaloids, Coca- Coca alkaloids, Cannabis and its products, Poppy straw, Synthetic drugs such as pethidine etc.

- A psychotropic substance, according to the act is any substance natural or synthetic or any natural material or any salt or preparation of such substance or material specified in the scheduled list of 77 psychotropic substances, which include substances like cannabis, amphetamines, tranquillisers, LSD, barbiturates, benzodiazepines, psilocybine, mescaline etc.
- **Chapter II** details the authorities and officers in the Central Government who can take all measures as it deems necessary or expedient for the purpose of preventing and combating abuse of narcotic drugs and psychotropic substances and the illicit traffic.
- It also explains about the national fund for control of drug abuse. The Central Government may, by notification in the Official Gazette, constitute a Fund to be called the National Fund for control of drug abuse.
- **Chapter III** details on the Prohibition, control and regulation on cultivating coca plant, opium poppy or any cannabis plant; or producing, manufacturing, possessing, selling, purchasing, transporting, ware-housing, using, consuming, import inter-State export inter-State import into India, exporting from India or transshipment of any narcotic drug or psychotropic substance, except for medical or scientific purposes and in the manner and to the extent provided by the provisions of this Act or the rules or orders made thereunder and in a case where any such provision, imposes any requirement by way of license, permit or authorization also in accordance with the terms and conditions of such license, permit or authorization.
- **Chapter IV** of this act explains about the Offences under the Act and punishments to be applied for contravening provisions of the Act.
- **Chapter V** describes the procedures with regards to penalty of property derived from, or used in, illicit traffic etc. Anyone who contravenes the NDPS Act will face punishment based on the quantity of the banned substance.
- A list of the current definition of a small quantity and a commercial quantity for some popular drugs has also been detailed in this chapter.

Amendments:

- This NDPS act has undergone amendments in 1988, 2001 and 2014.

- The 2014 amendment (Act No. 16 of 2014) amended the NDPS Act to relax restrictions placed by the Act on Essential Narcotic Drugs like Morphine, Fentanyl and Methadone, making them more accessible for use in pain relief and palliative care.
- The Amendment also contained measures to improve treatment and care for people dependent on drugs, opened up the processing of opium and concentrated poppy straw to the private sector, and strengthened provisions related to the forfeiture of property of persons arraigned on charges of drug trafficking.
- The Amendment also removed the NDPS Act's imposition of a mandatory death sentence in case of a repeat conviction for trafficking large quantities of drugs, giving courts the discretion to use the alternative sentence of 30 years imprisonment for repeat offences.
- However, the Amendment increased the punishment for "small quantity" offences from a maximum of 6 months to 1 year imprisonment.

Important Questions

Short Answers:

1. NDPS Act.

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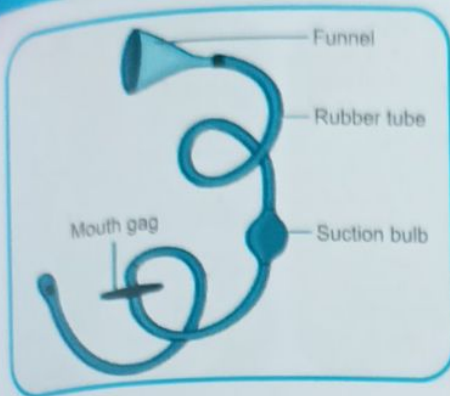
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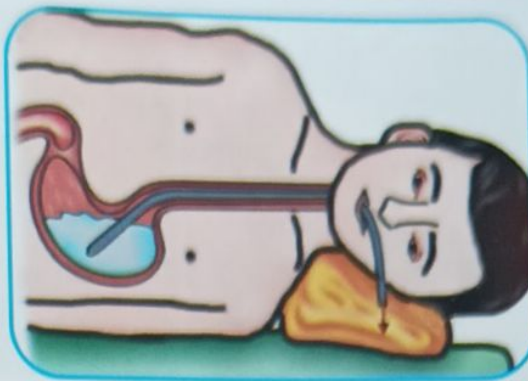
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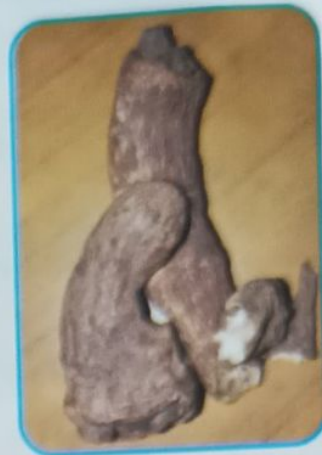
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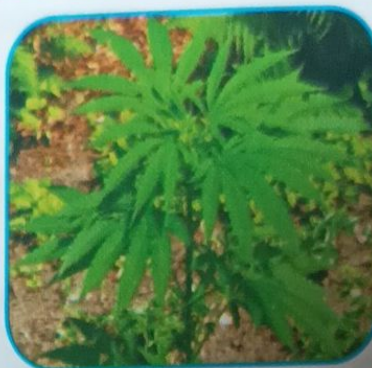
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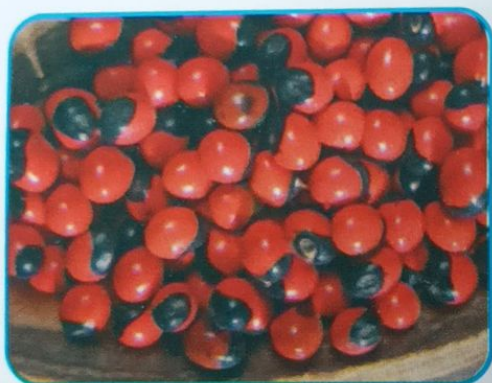
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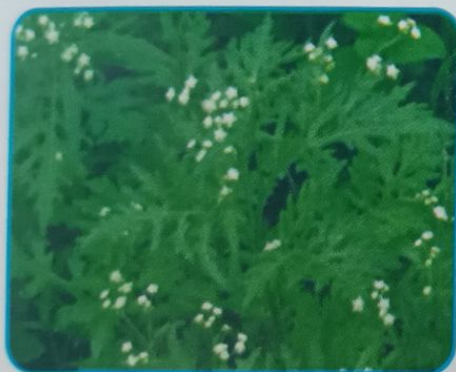
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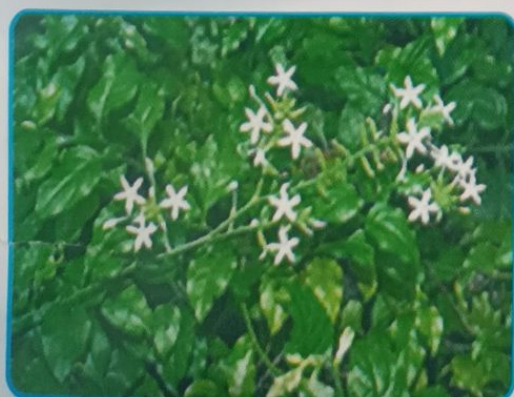
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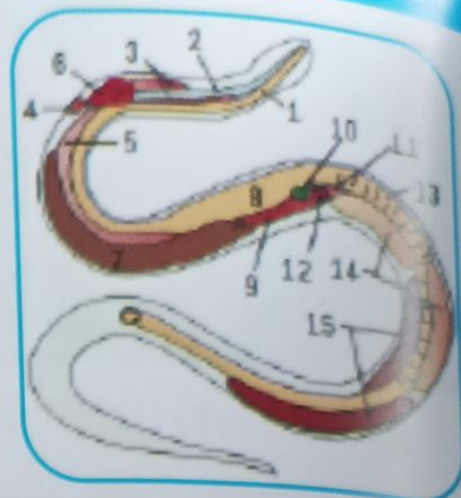
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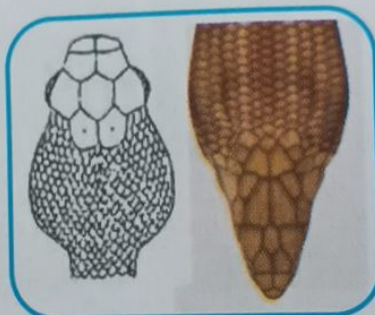
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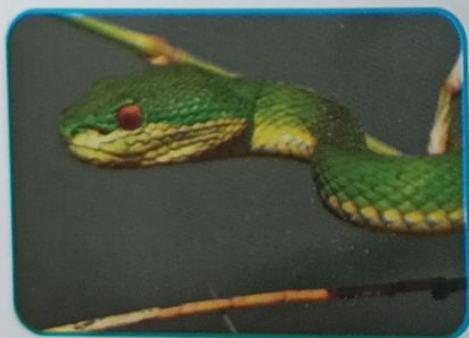
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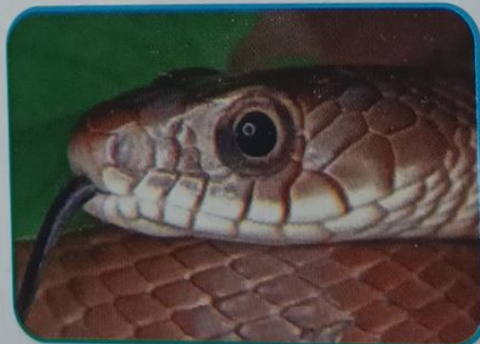
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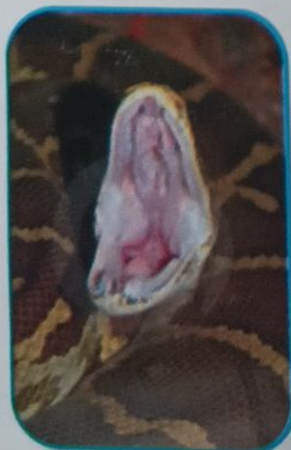
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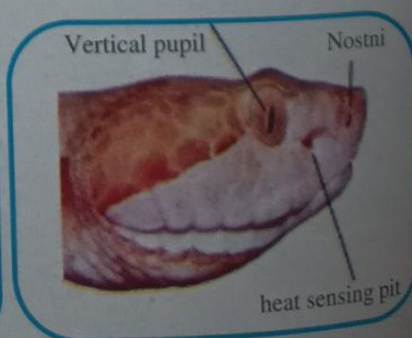
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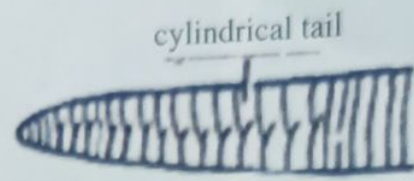


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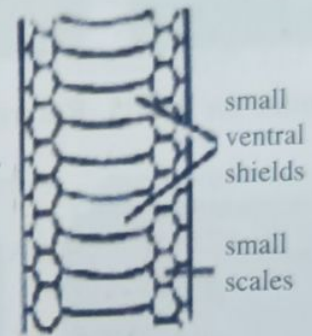
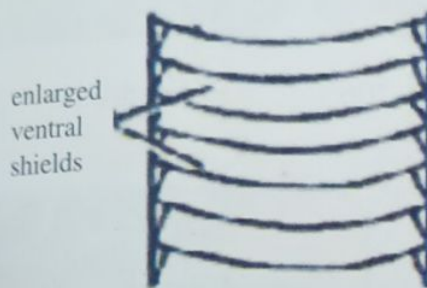


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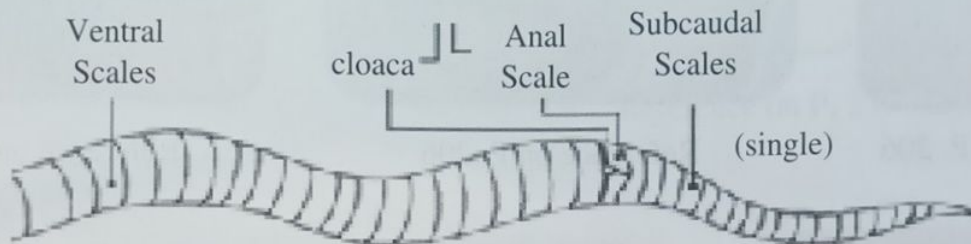
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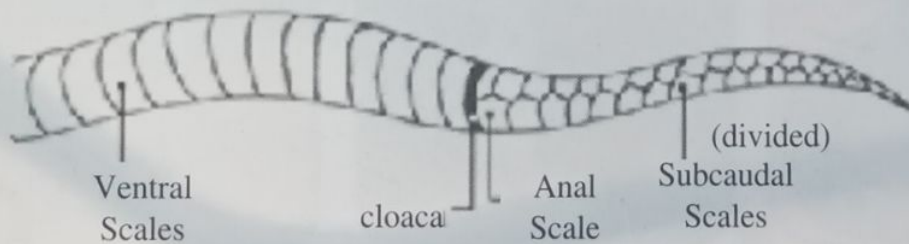
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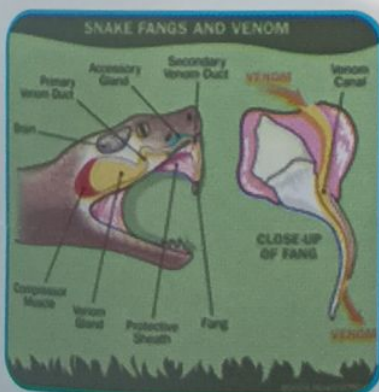
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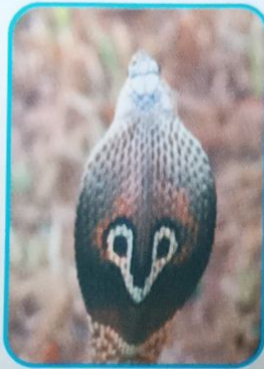
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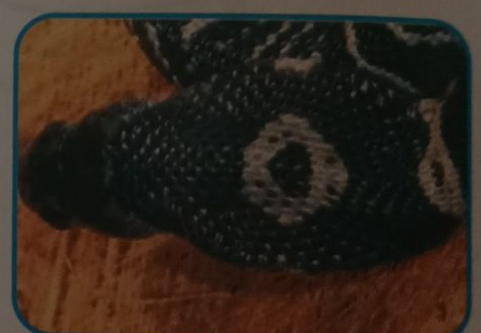
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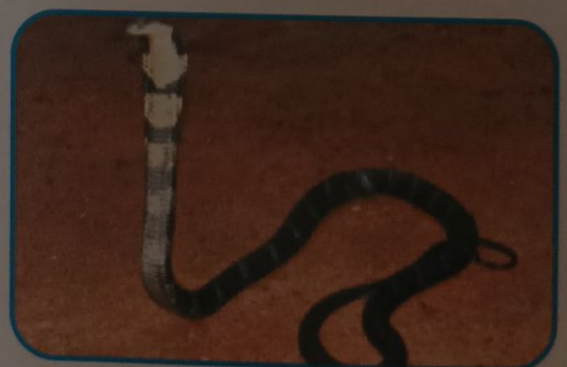
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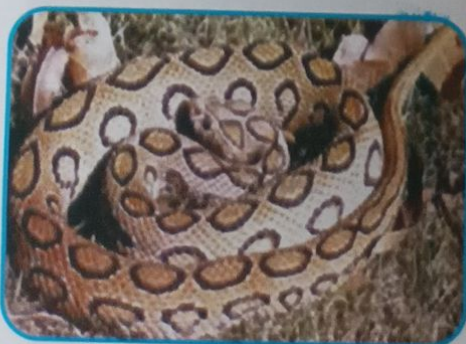
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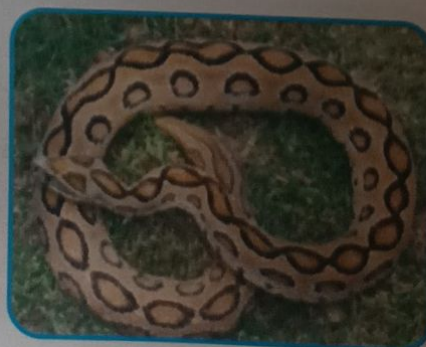
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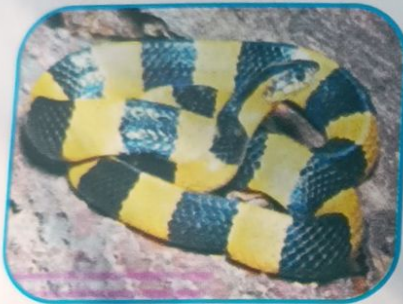
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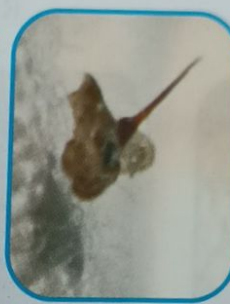
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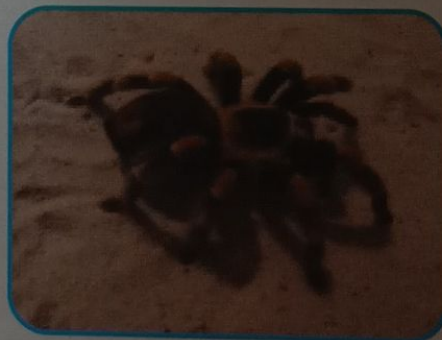
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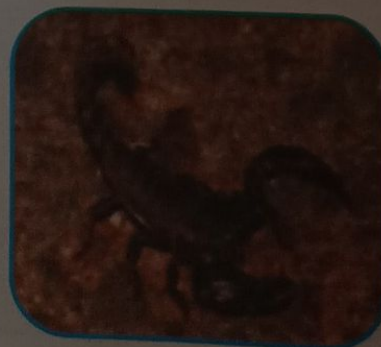
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